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CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICE—
Seventh Annual Meeting, Pacific Coast Gas Association..... 41

EDITORIALS—
Briefly Told 41
The Trade Returns—Notes.

CORRESPONDENCE—
Mr. Forstall on Mr. Glasgow's Lecture..... 42
Proceedings, Twenty-second Annual Meeting of the Western Gas Association—Official Report—Revised by the Secretary—Continued from page 14 42
Second Day, Morning Session—Election of Officers—A Telegram of Sympathy—Next Place of Meeting—Report of Committee on President's Address—Report of Committee on Memorials—Report of Committee on Publication of Proceedings—A Telegram from President Thompson—Tidings from Over Sea—Roll Call—*Wrinkle Department—Discussion—*Reports of Committee on Isolated Generators for Bench Firing—Discussion.
Tarred Mcadam..... 53
*A Self-Correcting Photometer Scale, by Mr. B. Speed..... 53

ITEMS OF INTEREST FROM VARIOUS LOCALITIES..... 54
Bond Issue by Ogden Gas Company, Chicago—No Municipal Plant for Los Angeles, Cal.—Proposing to Improve the Richmond (Va.) Plant—Annual Meeting, Kansas City, Mo.—Gas Works for Mount Vernon, Ills.—Consolidation at Willimantic, Conn.—To Improve the Quincy (Ills.) Plant—A Hint from Spencer, Mass.—A Narrow Escape—Mr. C. L. Gerould in New Fields—The Indianapolis Contract—And Other Items.
Electric Light Standards..... 55
The Approaching Famine in Iron..... 56
The Market for Gas Securities..... 56

[OFFICIAL NOTICE.]

Seventh Annual Meeting, Pacific Coast Gas Association.

OFFICE OF THE SECRETARY, OAKLAND, CAL., June 7, 1899.

The seventh annual convention of the Pacific Coast Gas Association will be held in the city of San Francisco, Cal., on Tuesday and Wednesday, July 18th and 19th, 1899, commencing at 10 A.M. The meeting place will be the office of the San Francisco Gas and Electric Company, No. 413 Post street.

Papers will be contributed by :

"President's Address," by Mr. Charles F. Adams.
"Coal Combustion," by Mr. John L. Howard.
"Electrolytic Trials," by Mr. Wm. A. Aldrich.
"Gas Stoves, from Foundry to Consumer," by Mr. L. Kahn.
"Determinations," by Mr. J. B. Grimwood.
[Title to be announced], by Mr. Oscar B. Weber.
"Experiences," by Mr. F. H. Eichbaum.
"Historical Review," by Mr. W. M. Parker.
"Wrinkle Department," edited by Mr. G. H. Hollidge.
"Experience Department," edited by Mr. John Clements.

An excursion on the Bay of San Francisco, to the Union Iron Works, Mare Island and other points of interest, will be made on Thursday.

The Secretary will be in attendance at headquarters, No. 413 Post street, Tuesday, until 10 P.M., to meet members and afford information.

Queries for "Question Box" should be sent in prior to July 15th for assignment to members.

JOHN A. BRITTON, Secretary.

BRIEFLY TOLD.

THE TRADE RETURNS.—For the first six months of the current year it was difficult, and more than ordinarily so, to secure or obtain returns from companies respecting their relative outputs, than it has been for many years back ; but the returns, so far received, omitting any from centers where large quantities of gas are consumed, go to show that gas is favored by the people. If the use of gas goes on satisfactorily in small centers of population it may be taken for granted that the progress is at least equal in places where the many live, be the occupants of such places "yokels" or otherwise. Our returns are so few that, from their teaching, we would fear to predicate a whole ; but the net increases, from the few we have received, go to show that the gain in sendout, between the first half of 1899 and the corresponding half of 1898, amounts to considerably over 12 per cent.—to be accurate, 12.18. That is a sufficiently good showing, even if the price of oil for enriching seems to keep more than pace with the output of the gas that goes through the consumers' meters.

NOTES.—Mr. H. L. McKee has been appointed General Manager of the Meridian (Miss.) Gas and Electric Light Company.——The "properties and franchises" of the Kalamazoo (Mich.) Gas and Electric Company are to be sold at auction the 1st prox. The concern was known as the Kalamazoo Heat, Light and Power Company.——At the annual meeting of the Milwaukee (Wis.) Gas Light Company the following officers were elected : Directors, Emerson McMillin, H. C. Payne, F. G.

Bigelow, Washington Becker, A. E. Smith, B. M. Weil, E. G. Cowdery, S. M. Green and J. P. Murphy; President, E. McMillin; First Vice-President, B. M. Weil; Second Vice-President, S. M. Green; Secretary and Treasurer, S. J. Glass; General Manager, E. G. Cowdery. ——The proprietors of the Cape Island Gas Company, of Cape May, N. J., have so far come to their senses as to declare a gross rate of $2 per 1,000, less 25 per cent. for prompt payment.——Mr. Case, who manages the municipal gas plant at Duluth, Minn., finds that the cost of gas "in the holder" at that point is not less than 31 cents per 1,000 cubic feet. How about municipal management?——The proprietors of the Knoxville (Tenn.) Gas Light Company have reduced the selling rate to $1.10 per 1,000 cubic feet, less 10 per cent. for prompt payment. Good-bye to the financiers who sought to advance the Tennessee Gas and Coke Company.——The Westchester Gas and Coke Company does not seem to have done as well with Mayor Dillon, in New Rochelle, N. Y., as it did with Mayor Fiske in the adjoining suburb of Mount Vernon, N. Y. Only a matter of gas prices—of gas rates we should have said. Fiscal trading is difficult and complex.

Correspondence

[The JOURNAL is not responsible for the opinions expressed by correspondents.]

Mr. Forstall on Mr. Glasgow's Lecture.

ALFRED E. FORSTALL, GAS ENGINEER,
NEW YORK CITY, July 5, 1899.

To the Editors AMERICAN GAS LIGHT JOURNAL:

In the "Briefly Told" column of the JOURNAL for July 3d, you refer to Mr. A. G. Glasgow as "Electing to preach on the theme as to whether exposure to water or coal gas would do the exposed the most harm," upon the occasion of his being chosen to lecture before the Incorporated Gas Institute, and censure him both for his choice and for his treatment of the subject. A moderately careful reading of this lecture, as reported in the *Journal of Gas Lighting*, etc., and the *Gas World*, shows that the subject was selected *for*, and not by, Mr. Glasgow; the Council of the Institute having invited him to deliver a lecture upon an indicated subject. That being "Carbureted Water Gas, with Reference to the Recent Report of the Department Committee," which report, to a casual observer, seems a rather severe criticism of American practice in distributing water gas, it would appear that the lecturer, in showing up the weakness of the Committee's premises and conclusions, was doing good service for American gas companies, and deserved praise rather than censure.

Suppose the Cincinnati case reversed, the would be opposition offering coal gas and the old Company supplying water gas, as might easily be the case, could not this report be used very effectively by the opposition; and would not Mr. Glasgow's lecture be of great utility in rebuttal?

Further, it seems to me that you err in implying that Mr. Glasgow speaks of the population of all our large cities as "mongrel." He was speaking only of those large cities that receive the greater portion of the flood of immigrants that has swept over to this country, and expressly mentions the better quality of the population of the cities that do not suffer in this way.

Neither do I see what his being a Virginian has to do with the case. I am a Louisianian but feel myself just as good a judge of the relative merits of gas for burning or breathing as if I had been born in New York or Maine.

I am also usually considered as inclining more to coal gas than to water gas, as far as sentiment comes into such a question; but I do not see wherein Mr. Glasgow's lecture displays any personal zeal for water gas.

We, in this country, long ago accepted, or, at any rate, have acted as if we accepted, the opinion that the percentage of carbonic oxide in an illuminating gas was not of much consequence, except as a matter of dollars and cents. This is all that the lecturer attempted to prove, and it must be admitted that he succeeded very well in his attempt.

Of course, Mr. Glasgow is well able to take care of himself, but it is a "far cry" to London and back, and I do not like to let the false impressions, that your comments are apt to give to those who do not read his lecture, go uncorrected for so long a time.

Yours truly,
A. E. FORSTALL.

[OFFICIAL REPORT—REVISED BY THE SECRETARY—CONTINUED FROM PAGE 14.]

PROCEEDINGS, TWENTY-SECOND ANNUAL MEETING, WESTERN GAS ASSOCIATION.

HELD AT HOTEL PFISTER, MILWAUKEE, WIS, JUNE 14, 15 AND 16, 1899.

SECOND DAY, THURSDAY, JUNE 15—MORNING SESSION.

The Association reassembled for the second day's sessions at 10 A. M., June 15. The President, in announcing that the first business in order was the

ELECTION OF OFFICERS,

said:

The Committee on the address of President Thompson having prepared a report on his recommendation as to a change in our mode of electing officers, it will perhaps be best to take that matter up for consideration at the time the report is presented. Mr. Thompson's recommendation is: "In order that the effect of this plan may be determined I recommend that at the current election no nominations be made, but that the voting for each office be confined to the candidates whose names appear on the first ballot in each case." The recommendation is that there shall, first, be an *informal* ballot, and that on the second ballot the members shall vote for the candidates who are named for the respective offices. The Chair was a member of the Board of Directors at the time the innovation was made in the election of officers, and it was the intention of the Board at that time to have the first ballot an informal one, but owing to the fact that the nominations were made orally the intention was not fully carried out. President Thompson believes the only true democratic method of electing officers is to have an informal ballot expressing the wishes of the members of the Association, as that the action shall be spontaneous. That question is presented for your action.

On motion of Mr. Odiorne, seconded by Mr. Eaton, the informal balloting plan was adopted. Messrs C. E. Sanderson, G. T. Murdock and E. C. Brown were appointed tellers. The Chairman explained that plans made well ahead by First Vice-President Copley, which involved his absence from the United States during the time of the next annual meeting, would prevent him from accepting promotion in the regular order. On motion of Mr. Eaton, the rules were suspended, and the Second Vice-President, Mr. William McDonald, of Albany, N. Y., in accordance with the report of the tellers, was declared elected President for the ensuing year.

President-elect McDonald, in acknowledging his election, said—Gentlemen, I thank you most heartily for this expression of your confidence. Situated as I am I think no one could feel more deeply the honor that you have conferred upon me in making me the President of our Association; and I assure you that, so far as my ability goes, I I shall serve you as best I can. (Applause.)

On motion of President-elect McDonald, First Vice-President Copley was elected to succeed himself. Responding to the announcement of the vote Mr. Copley said: As I think I have done enough speech making, let me simply thank you sincerely for this renewed evidence of your confidence.

The ballot for Second Vice-President resulted in the election of Mr. Thomas D. Miller, of Dallas, Texas, who acknowledged his promotion by saying: I am very grateful to you for this expression of your esteem; and I thank you in the name of the great State of Texas for the honor conferred upon her through me. I believe I am the first member of a Gas Association from Texas to hold this office in our Association. I am quite sure my gratitude to you for this evidence of your confidence is as great as is the broad domain of the Empire State of the Southwest.

On motion of Mr. Murdock, the rules were suspended and Mr. J. W. Dunbar, of New Albany, Ind., was elected to succeed himself as Secretary and Treasurer. Responding to the notification, Mr. Dunbar said: Gentlemen, I thank you for the honor you have conferred upon me in re-electing me as your Secretary. I do not know of anything that gives me more pleasure than to serve this Association, not only from the character of the men who are connected with it, but because I am serving an industry in which I make my living. I always look forward with pleasure to these meetings, and I am sure that the pleasant greetings, the good companionship and fellowship that prevail among us cannot help but be sources of pleasure and enjoyment to each of us. Again, I thank you most heartily.

The balloting for representation on the Board of Directors resulted in the following selections:

Term Expires, May, 1900.—A. H. Barret, Louisville, Ky.

Term Expires, May, 1901.—Z. T. F. Runner, Freeport, Ills; Geo. McLean, Dubuque, Iowa; B. W. Perkins, South Bend, Ind.; John Gimper, Galveston, Texas.

A Telegram of Sympathy.

On motion of Mr. Howard, who explained that he had just received information announcing the death of the wife of Past President Isaac C. Baxter, the following telegram was forwarded to Mr. Baxter;

"You have our deepest sympathy in your great sorrow."

Next Place of Meeting.

Mr. McLean, from the Committee on Next Place of Meeting, reported that the Committee recommended Chicago. The recommendation was unanimously indorsed.

Report of Committee on President's Address.

The Secretary read the following report from the Committee on President's Address, which was, on motion, ordered filed and its recommendations adopted:

The Committee to whom was referred the Address of the President report as follows: We heartily indorse the many practical and valuable suggestions made, and recommend that each member of this Association shall consider the address in the nature of a personal letter from our good President, who we so much regret could not be with us.

It is possible that some of our new members might by inference imagine, from a part of the address, that there had been in the past a lack of interest and participation in these meetings, which, of course, is in no sense true. Greater efforts to accomplish greater things are of course commendable, and in this sense you are urged as individuals to contribute by your attendance and your debates, and by helping to swell the membership list and attendance at the meetings.

We recommend that the recruiting committee and sub-committees which have done so much good work, as shown by the new members introduced, be continued, to the end that we may further expand and prosper. We suggest that this committee have printed certain literature which shall be in the nature of an appeal to gas companies and which shall tell of the good work done by our Association and the advantages to be derived by having their companies well represented in our conventions.

We also recommend the adoption of the Suggestion Box in connection with the Wrinkle Department. Many ideas and devices may thereby be developed into valuable service.

In regard to changing the manner of holding elections, we are of the opinion that it would not be advisable to do so at this session, because of the greater time which would probably be required and which could not well be afforded at a business session. Were the election to be held in the evening, as was evidently anticipated by the President when the address was written, we would certainly favor a change in the manner of electing officers.

C. H. Dunbar,
J. J. Knight.

Mr. T. C. Jones here read the following

Report of Committee on Memorials.

Whereas, It has pleased Almighty God in His infinite wisdom to remove from us during the past year two of our esteemed associates, Mr. H. C. Bolcom, of Winona, Minn., who died February 11th, 1899, and Mr. B. P. Holmes, of Youngstown, O., whose death occurred February 13th, 1899.

Be it Resolved, That, as a mark of respect, we inscribe upon the records of this Association our appreciation of their honor, integrity and worth, with a keen sense of loss sustained in their death. Be it further

Resolved, That the sincere and heartfelt sympathy of this Association be extended to their families and friends.

T. C. Jones,
James Ferrier,
J. W. Murdock, } Committee.

On motion of Mr. Jenkins the report was adopted, and the Secretary was instructed to send a copy to the families of each of the deceased members.

The Secretary read the following

Report of Committee on Publication of Proceedings.

Milwaukee, June 15th, 1899.

To the President and Members of the Western Gas Association—Gentlemen: Your Committee on Publication of Proceedings submits the following report.

The "Proceedings" of the Nineteenth, Twentieth and Twenty-first Annual Meetings of this Association, having been collated and edited by President George Treadway Thompson, were turned over to your committee for publication. The contract appended to this report, and made part of it, was obtained, making the average price per volume, for 600 volumes, about $1.21. It was thought best to contract for this number of volumes as the last 100 copies cost but $40 more.

The general size and style of the volume will correspond closely with the published "Proceedings" of the American Gas Light Association, and will contain between 500 and 600 pages. It is hoped to be able to distribute the publication in the latter part of July.

The committee desires to acknowledge its obligation to President Thompson for his valuable work in collating and editing the "Proceedings," to Secretary Dunbar for his assistance in collecting data necessary for the work, and to Mr. E. C. Brown for his courtesy in loaning the committee cuts or illustrations embodied in the three years' "Proceedings." Respectfully submitted,

O. O. Thwing,
W. McDonald, } Committee.

The report having been received and ordered filed, on motion of Mr. Dunbar, the thanks of the Association were voted to Mr. Thwing for the work done by him as a member of the Committee.

A Telegram from President Thompson.

The Secretary read the following telegram, which was heartily cheered:

"Denver, Col., June 14, 1899.

"Jas. W. Dunbar, Secretary Western Gas Association:

"Many thanks for kind messages. Congratulations upon magnificent work of membership committee. Hearty wishes for the continued success of the meeting.

Geo. Treadway Thompson."

Tidings from Over Sea.

The following lines from ex-Secretary Littleton, as read by the Secretary, were received with applause:

Vienna, Austria, May 24, 1899.

"Mr. J. W. Dunbar, Secy. Western Gas Association: My dear Dunbar:

"For the first time in the history of the dear, old Western Gas Association, I am compelled to be absent at roll call, but I'll try to not let this sort of thing happen again. That you may all enjoy a pleasant meeting, and have a right royal good time generally, is the heartfelt wish of yours truly,

A. W. Littleton."

ROLL CALL.

The Roll Call developed the presence of the following members:

Honorary.

Slater, A. B., Providence, R. I.
Barker, F. E., Boston, Mass.
Howard, J. B., Galena, Ills.

Active.

Baehr, W. A., Milwaukee, Wis.
Barret, A. H., Louisville, Ky.
Barthold, W. H., Grand Rapids, Mich.
Bates, T. A., Portsmouth, O.
Blinks, W. M., Michigan City, Ind.
Blodget, C. W., Brooklyn, N. Y.
Butterworth, I., Columbus, O.
Callender, E. P., New York City.
Chollar, B. E., St. Louis, Mo.
Clary, E. D., Burlington, Ia.
Copley, I. C., Aurora, Ills.
Corscot, J., Madison, Wis.
Cowdery, E. G., Milwaukee, Wis.
Cowdery, R. E., Topeka, Kas.
Cressler, A. D., Fort Wayne, Ind.
Cross, P., Detroit, Mich.
Dell, J., St. Louis, Mo.
Doty, P., Grand Rapids, Mich.
Doherty, H. L., Madison, Wis.
Dunbar, C. H., Elgin, Ills.
Dunbar, J. W., New Albany, Ind.
Eastman, I. M., Monmouth, Ills.
Eaton, W. M., Jackson, Mich.
Elbert, V. L., Chicago, Ills.
Ellison, B. F., St. Paul, Minn.
Eysenbach, E. E., Columbus, O.
Faben, C. R., Jr., Toledo, O.
Ferrier, J., Columbus, Ga.
Forbes, J., Chattanooga, Tenn.
Fullerton, G., Jr., Buffalo, N.Y.
Gimper, J., Galveston, Tex.
Glass, S. J., Milwaukee, Wis.
Goodno, G. F., Cedar Rapids, Ia.
Howden, J. J., Muskegon, Mich.
Jenkins, E. H., San Antonio, Tex.
Jones, T. C., Delaware, O.
Jones C. D., Independence, Ia.
Kennedy, J. M., Rockford, Ills.
Knight, J. J., Kalamazoo, Mich.
Landon, H. McK., Indianapolis, Ind.
Lathrop, A. P., Columbus, O.
Lynn, J. R., Benton Harbor, Mich.
Lynn, J. T., Detroit, Mich.
McAdams, B., Michigan City, Ind.
McClary, N. A., Chicago, Ills.
McLean, G., Dubuque, Ia.
MacMillan, G., LaCrosse, Wis.
McMillin, E., New York City.
Miller, T. D., Dallas, Tex.
McDonald. W., Albany, N. Y.
Mitchell, K. M., St. Joseph, Mo.
Montgomery, J., Sedalia, Mo.
Morgans, W. H., Pontiac, Mich.
Moses, F. D., Trenton, N. J.
Murdock, G. T., Elkhart, Ind.
Murdock, J. W., Ottawa, Ills.
O'Malley, P., Aurora, Ills.
Odiorne, W. H., Springfield, Ills.
Owens, C. J., St. Louis, Mo.
Perkins, B. W., South Bend, Ind.
Powell, W. E., Logansport, Ind.
Pratt, E. G., Des Moines, Ia.
Quinn, A. K., Newport, R. I.
Runner, Z. T. F., Freeport, Ills.
Shelton, F. H., Philadelphia, Pa.
Slater, H. C., Milwaukee, Wis.
Steinwedell, W., Quincy, Ills.
Stiles, A. K., Chicago, Ills.
Stacey, J. F., Nashville, Tenn.
Tayler, G. H., Warren, O.
Taylor, B., St. Paul, Minn.
Thwing, O. O., St. Louis, Mo.
Witherby, E. E., Lockport, N. Y.
Warmington, D. R., Cleveland, O.
Whipple, H. S., Rockford, Ills.

Associate.

Bredel, F., Milwaukee, Wis.	Kahn, L., Hamilton, O.
Brown, E. C., New York City.	Lloyd, E. F., Fort Wayne, Ind.
Buss, J., Milwaukee, Wis.	Mansur, J. M., Royersford, Pa.
Carpenter, H. A., Allegheny, Pa.	Osius, G., Detroit, Mich.
Clark, G. M., Chicago, Ills.	Persons, F. R , Toledo, O.
Claybourne, C. W., Chicago, Ills.	Ramar, J. E., Chicago, Ills.
Corbus, F. G., Chicago, Ills.	Roots, D. T., Connersville, Ind.
Dickey, C. H., Baltimore, Md.	Roper, G. D., Rockford, Ills.
Eaton, A. B., Chicago, Ills.	Russell, D. R , St. Louis, Mo.
Goodwin, W. W., Philadelphia, Pa.	Stratton, S. S., Chicago, Ills.
Guldlin, O. N., Fort Wayne, Ind.	Van Wie, E. G., Detroit, Mich.
Harper, H. D., Chicago, Ills.	Waugh, F. K., Chicago, Ills.
Hayward, S. F., New York City.	Wickham, L., St. Louis, Mo.
Jacobs, C. H., Detroit, Mich.	

The Chairman called upon Mr. E. H. Jenkins, as Editor, to detail the results of his work in connection with the

WRINKLE DEPARTMENT.

Retort Lid Table and Brackets.—Fig. 1, which represents a device for handling retort lids, is contributed by Mr. Eugene Printz, of Zanesville, O., and is described by him as follows :

"A device whereby the handling of retort lids (where self-sealers are not used) can be performed with greater convenience and cleanliness also with a saving of labor ; and it does away with the bending or breaking of lids, which is often the result of throwing them in a corner until needed again. The device consists of two pairs of brackets, made of ⅝ by 1½ inch iron of proper shape, bolted to 2 by 4 inch oak scantlings, which are in turn bolted to the wall so as to bring the brackets to the proper height for handling the lids. The luting bench, situated near the brackets, has shelves under it, on which are placed the prepared lids ready for use. The two pairs of brackets and bench as shown are ample to take care of the lids for five benches of 6's."

By Pass for Hydraulic Main Seal.—The arrangement shown in Fig. 2 is offered by Mr. Frederick Egner. He writes as follows :

"Originally it was introduced somewhere in 1870 or 1871, at the works of the then Metropolitan Gas Light Company, of New York city, and some years afterward was patented by somebody who reinvented the device; but the original designer did not apply for a patent, and even the first patent has long ago run out. The object of the device is to by pass the seal in the hydraulic main to some extent, the result being less carbon deposits in the retorts, reducing thereby the time lost through scurfing. That is one result. Another is, if the device is properly manipulated, an increase in quantity of gas recovered, as well as a slight increase of illuminating power. But this last can be reversed very easily, if the by-passes are not closed at the time the retorts are open, or if it is otherwise neglected, or if the superintendent wants to increase his yield merely by means of the exhauster. I have used these by passes in sizes from 1½ to 2 inches in diameter, and always with satisfactory results ; especially when applied to the ascension pipe of a retort in which oil was being carbonized for enriching purposes."

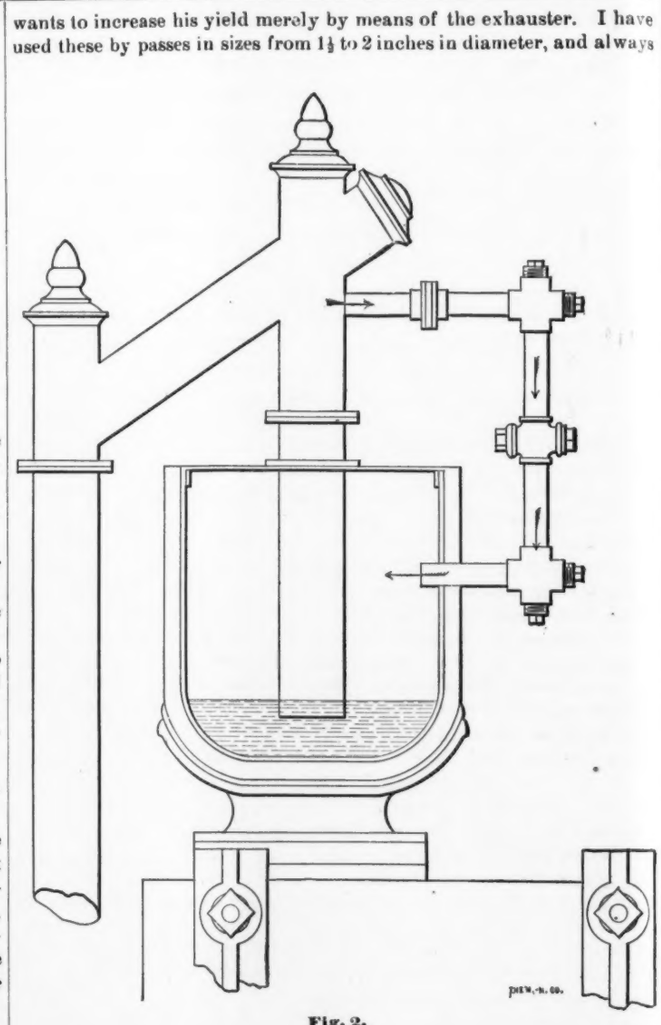


Fig. 2.

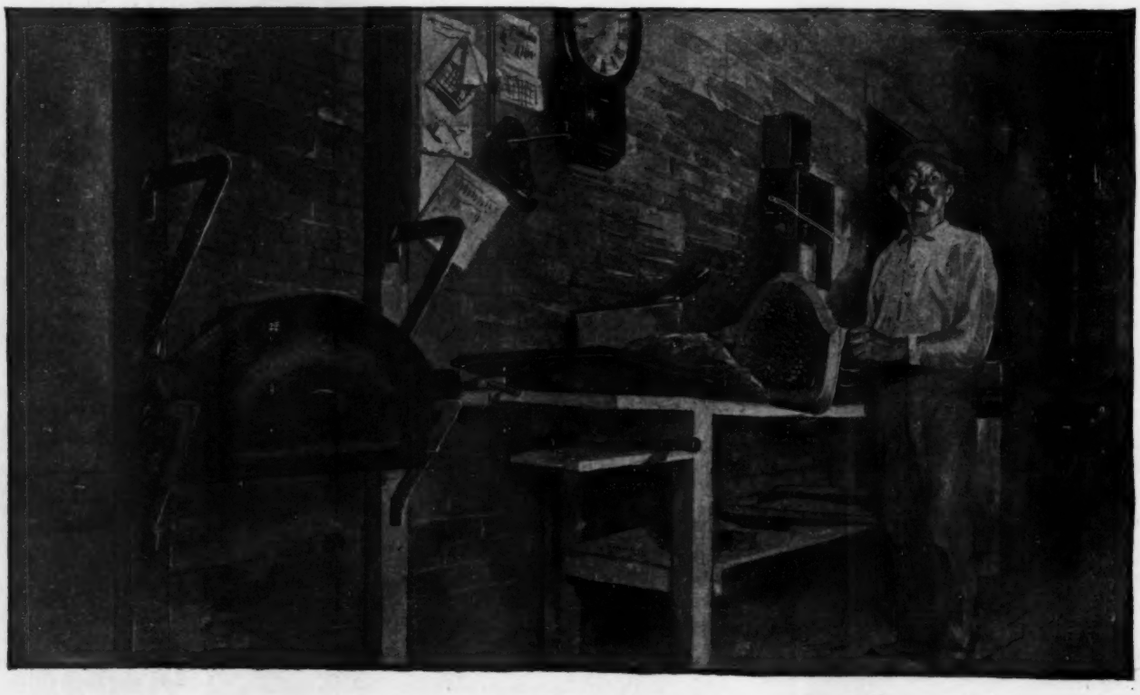


Fig. 1.

Tar Overflow for Hydraulic Main.—Two forms of appliance are shown. One (Fig. 3) is sent by Mr. V. L. Elbert, and is described as follows:

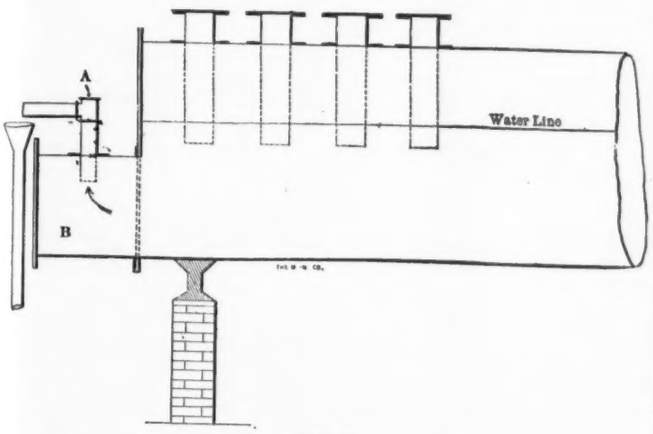


Fig. 3.

"It is especially applicable in gas works situated in cold climates, where sealpot for overflow usually freezes up, or gets coal dust or other substances mixed in it, requiring the frequent cleaning of the overflow pot. The seal can be altered by the lowering or raising of the pipe *A*, and the pipe *A* is very easily cleaned, as you will see. I have used them at several gas works with greatest satisfaction."

Mr. W. H. Odiorne, of Springfield, Ills, contributes the tar offtake, as shown in Fig. 4. It consists of a length of 12 inch cast iron pipe, placed on floor perpendicular in front of end of hydraulic main. The

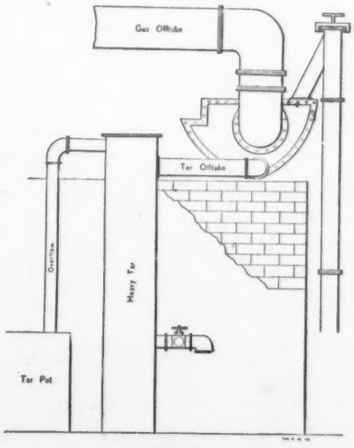


Fig. 4.

pipe is closed at bottom and is connected with extreme bottom of hydraulic main, allowing the heavy tar to pass off and accumulate in this pipe. This tar is drawn off in barrels or tar sewer once a day, water being admitted in the main at the time it is drawn off. The overflow of main is drawn off by a 2-inch pipe connected with large tar pipe at proper height to maintain the desired seal in dip pipe.

Down-Blast Arrangement for Water Gas Apparatus.—An arrangement for down-blast, that has been in successful operation in Johnstown, Pa., for some time, is shown in Fig. 5 (sections *AA* and *BB*); and Mr. A. Walters writes in regard to it as follows:

"Our plant is a Granger-Collins setting, remodeled after plans submitted by Mr. W. H. Wade, who designed the down-blast arrangement. The generators and superheaters were lengthened and a carburetor added. There was not sufficient room for the regulation down-run arrangement, and Mr. Wade was instructed to design a down-blast.

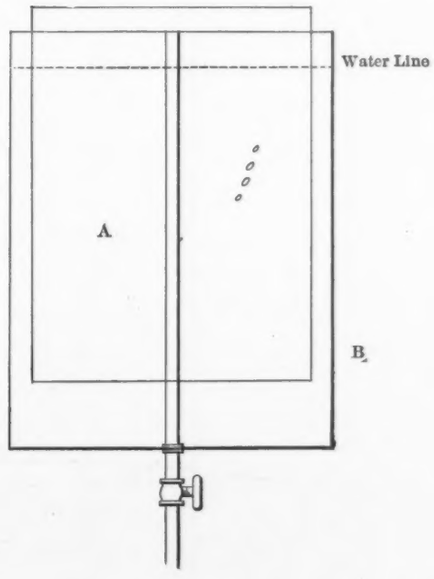
"Mode of operating our down-blast arrangement is as follows: In regular up-blast operation, valve on down-blast vent pipe is closed. When down-blast is used, superheater stack-valve is closed, all regular up-blast valves closed, and down-blast admitted through valve opening into connection between generator and carburetor, escaping through down-blast vent pipe connection at bottom of generator. The down-blast vent-pipe is carried outside of building. We have no regular periods for using down-blast, its use depending upon condition of generator fire, heat in carburetor and superheater, etc. With the use of this arrangement, deep and equally heated fuel beds are easily maintained, and checker work in carburetor and superheater can be prevented from overheating, preventing burning of oil, etc."

Scheme for Removing Tar or Other Deposits from Pipe Leading to Seal-Pot in Water Gas Apparatus.—Mr. W. H. Odiorne furnishes plan of a contrivance to accomplish this purpose. It is shown in Fig. 6, and described as follows:

It consists of a small hand-hole in take off pipe in water gas machine. It is placed near the operating floor just above the seal-pot. My idea in placing it there was to facilitate the removal of any tar or soot that might deposit and clog up the pipe where the gas entered the seal-pot, this being the point where we were most bothered with the old machine, and it has proved very convenient for removing any obstruction at that point; but we discovered another use for it. About every other day we open it, after we are through making gas, shut the stack-valve and blast through it, the intense heat and flame being carried from top of superheater down the pipe and out through the hand-hole, completely removing any collection of whatever kind, leaving the pipe as clean as when it was put up. The hand-hole is fitted with cover, clamp and screw, and the operation occupies but a few minutes.

Simple Apparatus for Testing Carbureted Water Gas During Operation of Machine.—Mr. Donald McDonald, of Louisville, Ky., furnishes a sketch, as shown in Fig. 7, and gives the following explanation of it:

"On a water gas apparatus it is easy to tell by the test light when the carbureted gas is good. It is, however, impossible to tell whether this



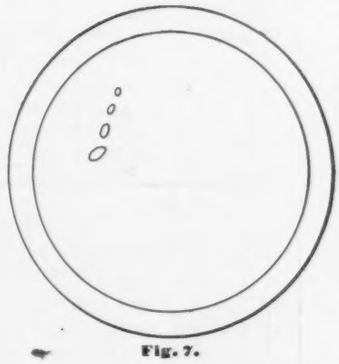


Fig. 7.

result is being achieved by making good blue gas and enriching it with a moderate amount of oil, or whether it is achieved by making bad blue gas and using an excessive quantity of oil. All authorities agree in saying that an excess of steam produces carbonic acid instead of carbonic oxide, and an analysis of the gas will show when this has oc-

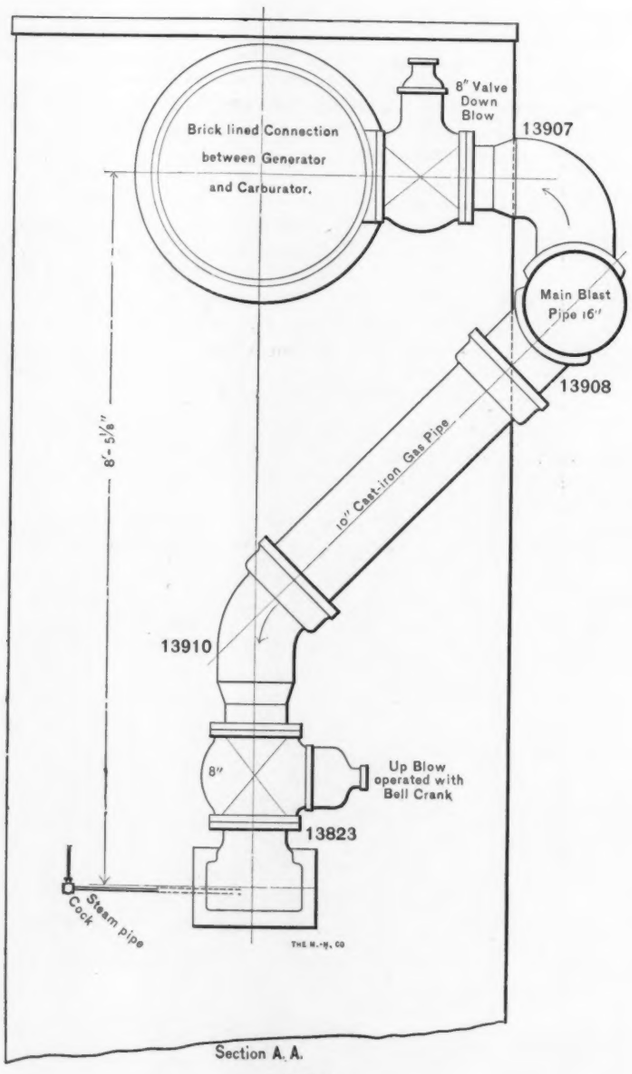


Fig. 5.

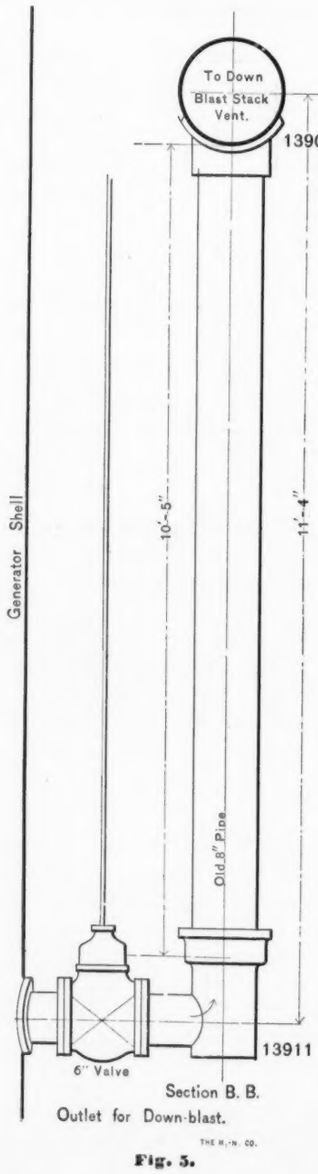


Fig. 5.

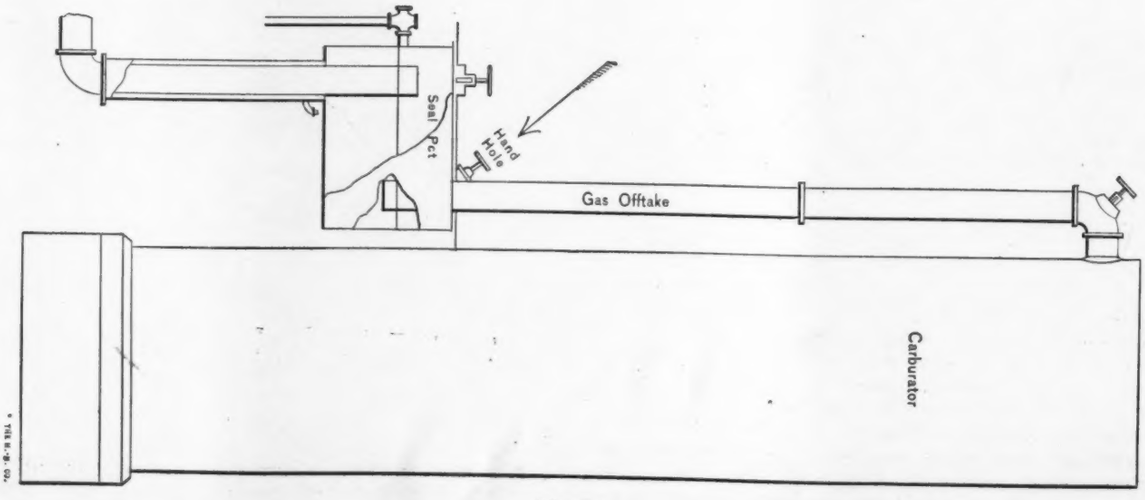


Fig. 6.

curred. It is, however worth very little to go to the gas maker and tell him that at 11 o'clock day before yesterday he was putting too much steam into his generator. My 'Wrinkle' is intended to enable the gas maker to see at a glance when this is going on. In order to do this I take advantage of the fact that the presence of an excessive quantity of carbonic acid extinguishes a flame, and any quantity makes it more or less tender. The flame must, however, burn at a uniform pressure, otherwise the indications would be valueless. I therefore take a stream of gas just after it leaves the generator and before it has been enriched. I bring it up under the small bell *A*, floating in the cup *B*. *A* has four holes in the top, ranging in diameter from 1-32 to 1-16 of an inch. It has also several openings down the side opposite the four holes and a stopcock on the inlet pipe to govern the amount of gas entering. The result is that, whenever gas is being made, the bell *A* is afloat and four streams of gas are issuing from the top at a uniform pressure. These are lighted. If all four of them burn the gas is good; if one or more of them go out it shows the presence of carbonic acid. Also, when gas is being made rapidly, the bell floats high up in the cup. If it is being made slowly it settles down until it submerges all of the holes in the side. A pilot light keeps it burning and we find it quite a valuable aid in making water gas. Of course a conical valve, like the one in a governor, would be better than the four holes in the side of the float."

Test to Determine Condition of Oxide Bed while in Use.—Fig. 8 illustrates an easy method of determining whether the bed of oxide is doing service or not.

Mr. Byron E. Chollar, of St. Louis, describes the arrangement as follows:

"It frequently happens that both the inlet and outlet sides of a purifying bed will show an equally foul test with lead paper while the bed may yet be doing work. The above shows how this condition may be ascertained. A pipe and stopcock leading from each side of the bed,

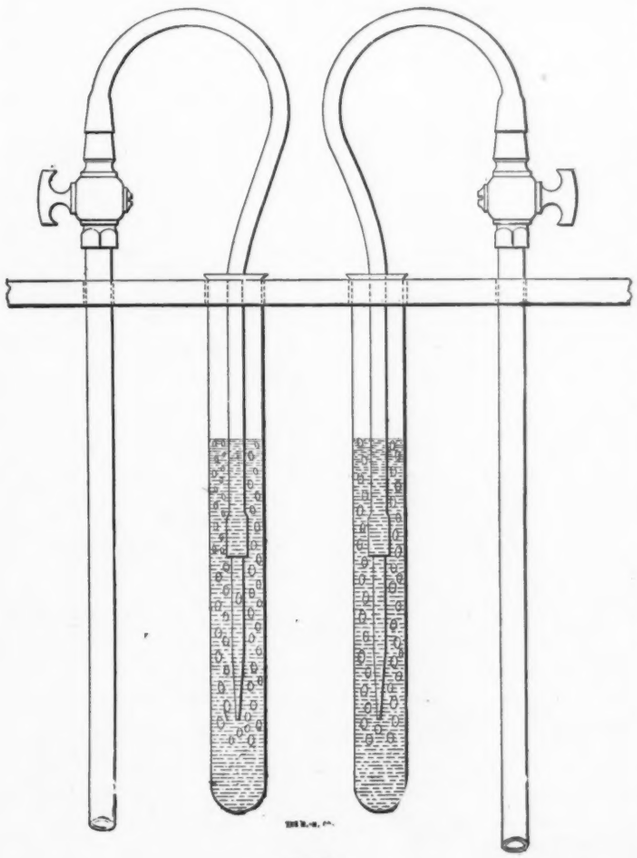


Fig. 8.

rubber tubes with glass nozzles of equal size attached, and a weak solution of permanganate of potash are all that is required. Put equal quantities of equal strength of the solution in the test tubes, insert the glass tubes and turn on the gas in both at the same time. Foul gas will make the solution clear almost immediately. If the bed is doing work the inlet side will clear up quicker than the outlet side.

"Two or three grains, or perhaps less, of permanganate to the quart of clean water is sufficient. Keep the solution in a well stoppered bottle, and don't make up too much at a time."

Electric Hand Lamp for Dangerous Places.—Mr. Frederick Egner calls attention to the electric glow lamp, arranged in a case 9¼ inches long and 2 inches in diameter. The lamp will give from 6,000 to 8,000 flashes, and is a very useful thing for a gas man who is obliged to go into places where a light is desirable, but where, on account of the presence of gas, it would be dangerous to use a match or ordinary oil lamp. These lamps are useful in purifying houses and in street work, when one has to make gas connections or repair a break after dark.

Old Trays for Oxide Revivification.—Mr. S. F. Hayward, of New York city, suggests the use of old trays for revivifying oxide, by putting them on scantling and raising them from the floor or ground, 4 or 6 inches. The oxide is revivified in one half the time, as the air is drawn through from underneath and seems to work up faster than it does where the material is placed on the floor and the air is only exposed from the top. The only care necessary is to see that the action does not go on too rapidly and the material take fire. The floor should also be of cement, brick or stone, so as to eliminate this danger. There should also be a floor underneath the trays, as considerable material sifts through in putting on and taking off.

Guide for Operator in Charge of Street Main Pressure.—Fig. 9 shows plan described by Mr. O. O. Thwing, of St. Louis, as follows:

"It consists simply of marking with a blue pencil, on the pressure sheet, the pressure line that is to be carried each day. This is done before the sheet is placed upon the pressure register. Our practice is to make a template of cardboard, corresponding to the sheet and the pressure order. The man who has charge of the pressure has simply to follow the blue line, and can have no excuse for errors in the time of increasing or decreasing pressure, while the chart ordered and the line produced, both being on the same sheet, are very convenient for comparison. In the card shown, the blue line represents the pressure desired and the red dotted one the pressure recorded. It will be noticed that the pressure was increased 5-tenths at about 9:45 A.M. on orders from the general office, as explained by the note."

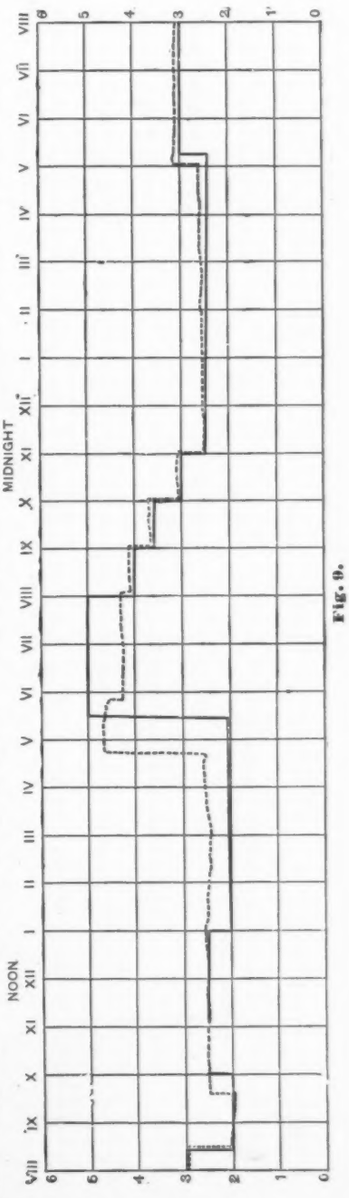


Fig. 9.

Method of Rapidly Measuring Distances for Pipe Lines, etc.—Mr. Albert F. Jenkins, of Buffalo, N. Y., states he has used his bicycle for this purpose frequently with very satisfactory results. Knowing the gear of your wheel, you know the distance traveled each revolution of the pedal, and by counting the number of revolutions of the pedal you can easily figure the distance traveled between the points to be measured.

Electric Lighting Attachment for Incandescent Gas Burners.—The principal objection usually found in fittings for lighting incandescent gas burners with electricity is that the mantle will not stand the jar of the pull chain attachments. These objectionable features have been eliminated in this new arrangement.

The burner operates with a smooth, easy action and is quite satisfactory. It is shown in Fig. 10.

Fig. 10.

Uniform Way for Valves to Open.—Mr. E. F. Lloyd, of Fort Wayne, Ind., offers the following:

"By the way, another 'Wrinkle' that occurs to me is to suggest that the Committee on Standard Fittings, if there is such actively engaged in the Association, investigate the question of using right closing valves universally. If we could get hold of the idiot who first introduced right *opening* ones when all kinds of small fittings, pipe threads and everything else close right, I think, in the vernacular, we would 'not do a thing' to him. This is prompted by your order for two 20-inch valves of that irregular kind, to fill which we have the pleasure of tearing apart some standard stuff and getting out what you want."

Holder Indicator Showing Contents by Meter Dial.—Mr. Thomas D. Miller, of Dallas, Texas, submits the scheme shown in Fig. 11. In regard to it he says: "This device was prompted by a desire to read with reasonable exactness the amount of gas made at each run of a 5-foot water gas set. The relief holder is a two-lift of 110,000 cubic feet capacity. The dial was taken from an old wet meter. The toothed wheel *B*, which sets in the main shaft of the drum, has 60 teeth and and actuates a 6-tooth pinion on the shaft carrying the hand of the dial indicating 100 feet at each division. The perimeter of the main drum, on which the cord winds in the spiral groove, is equal to the vertical depth of the holder that will contain 10,000 cubic feet. When the holder cups, the perimeter of the drum must become less in proportion as the lower lift of the holder is larger in capacity than the upper. The transition from the larger to the smaller drum is accomplished by conic thread consuming over half a revolution of the drum, while the sketch shows it to have been accomplished in one-half revolution.

"As great accuracy is impossible in such a device, owing to the oscillations of the holder, the readings will be as accurate as is necessary for the uses to which it is put. The spiral drum is cast of white metal and mounted on a brass shaft. The cord used should be a soft brass cable. The counter-weight can be suspended from a smaller drum on the main shaft so as to make the travel of the weight less, or it can be made to wind on the main drum and run beside the holder column. The dial is placed on the operating floor of the generator to be read after each run. Applied to storage holders, with dials set adjacent to station meters, and hourly readings being taken, the sendout can be calculated for any hour in the 24."

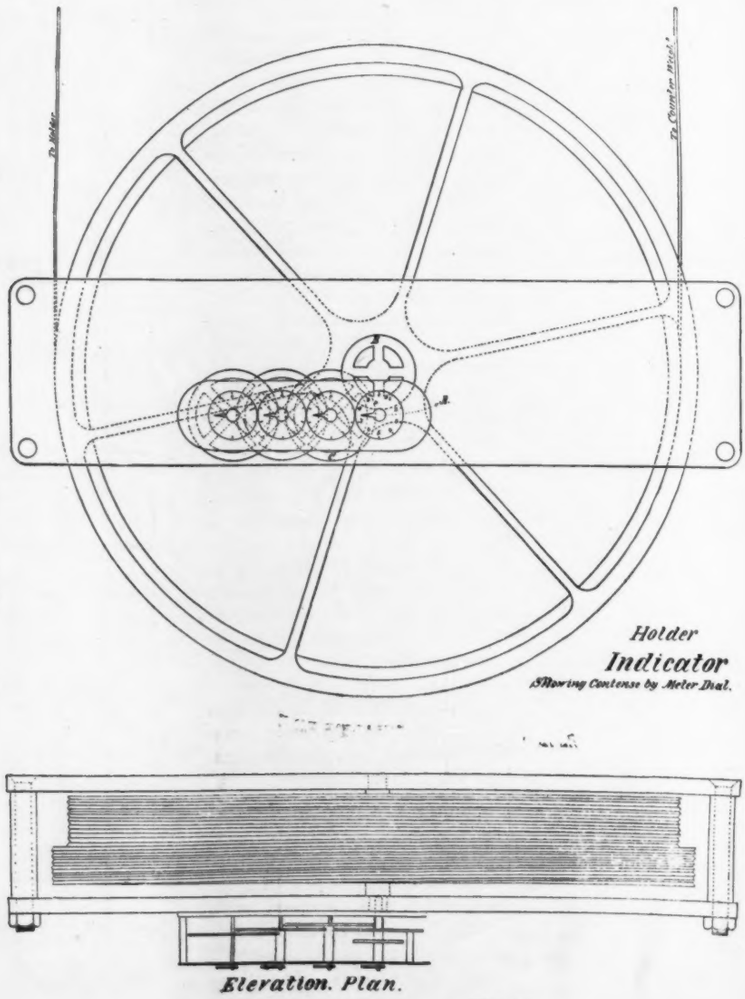
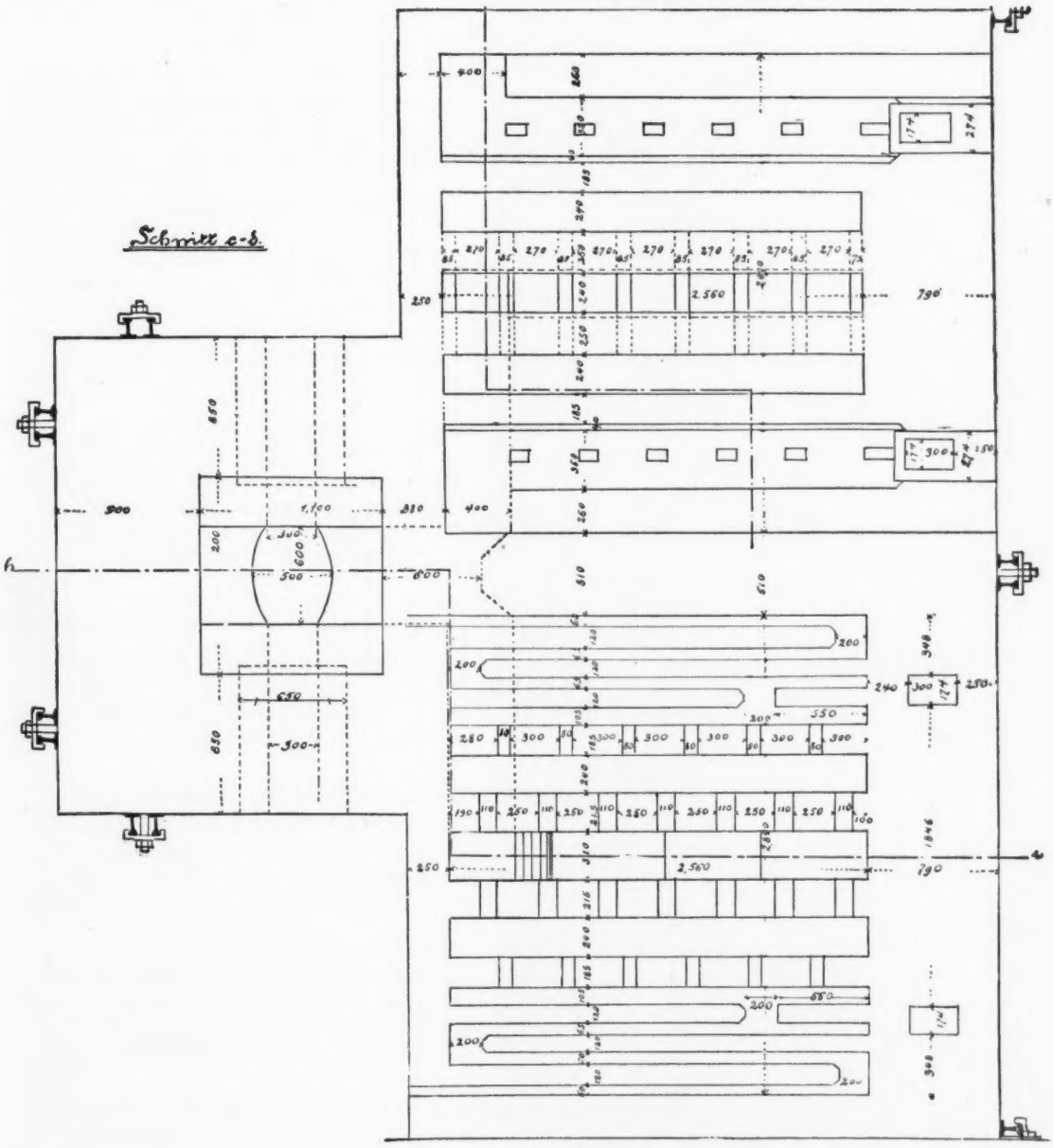


Fig. 11.

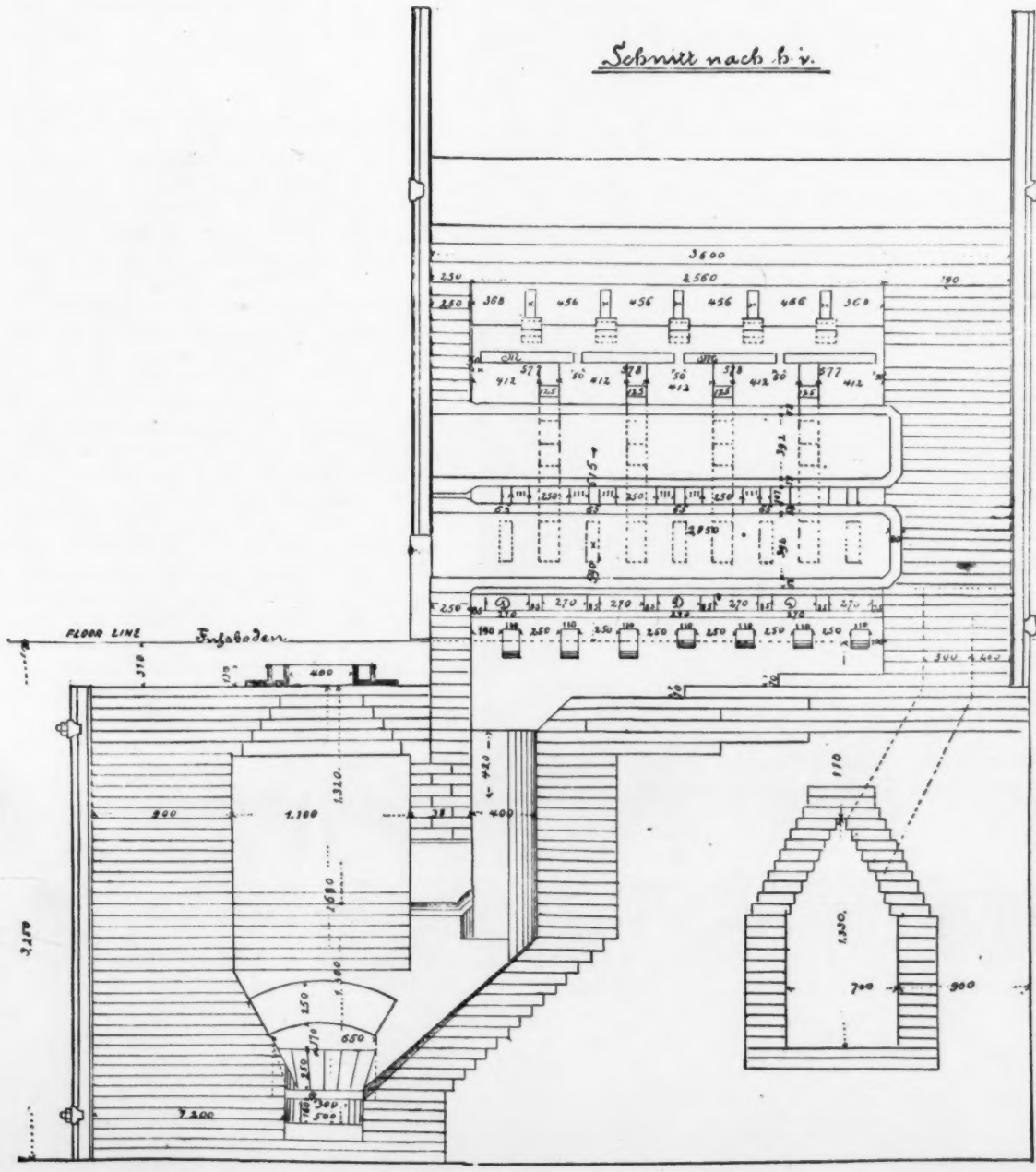
Schnitt nach a-b.

Schnitt c-d.



Schnitt nach e-g.

Schnitt nach h-i.



Gasanstalt Erfurt 11.

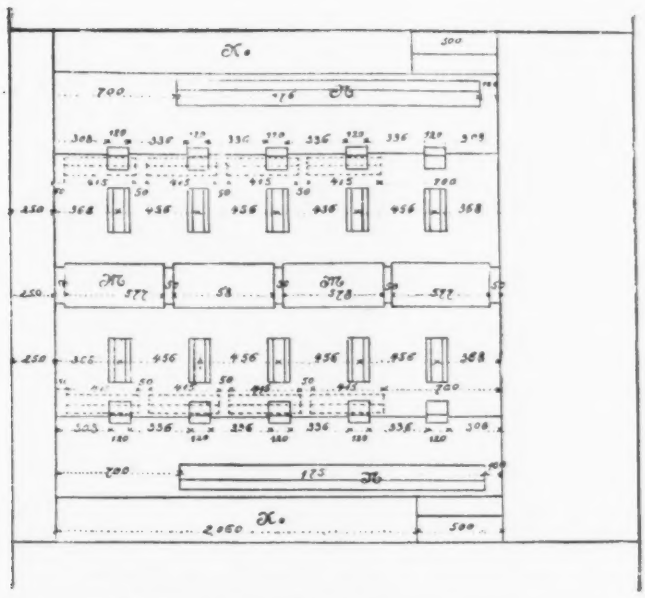
Generatorofen.

GAS WORKS AT ERFURT.

GENERATOR.

By W. E. Steinwedell.

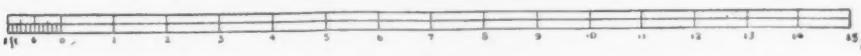
COPY OF BLUE PRINT.



Oberansicht (Gewölbe ist fortgenommen)

Scale 1:20.

Scale in feet & inches.



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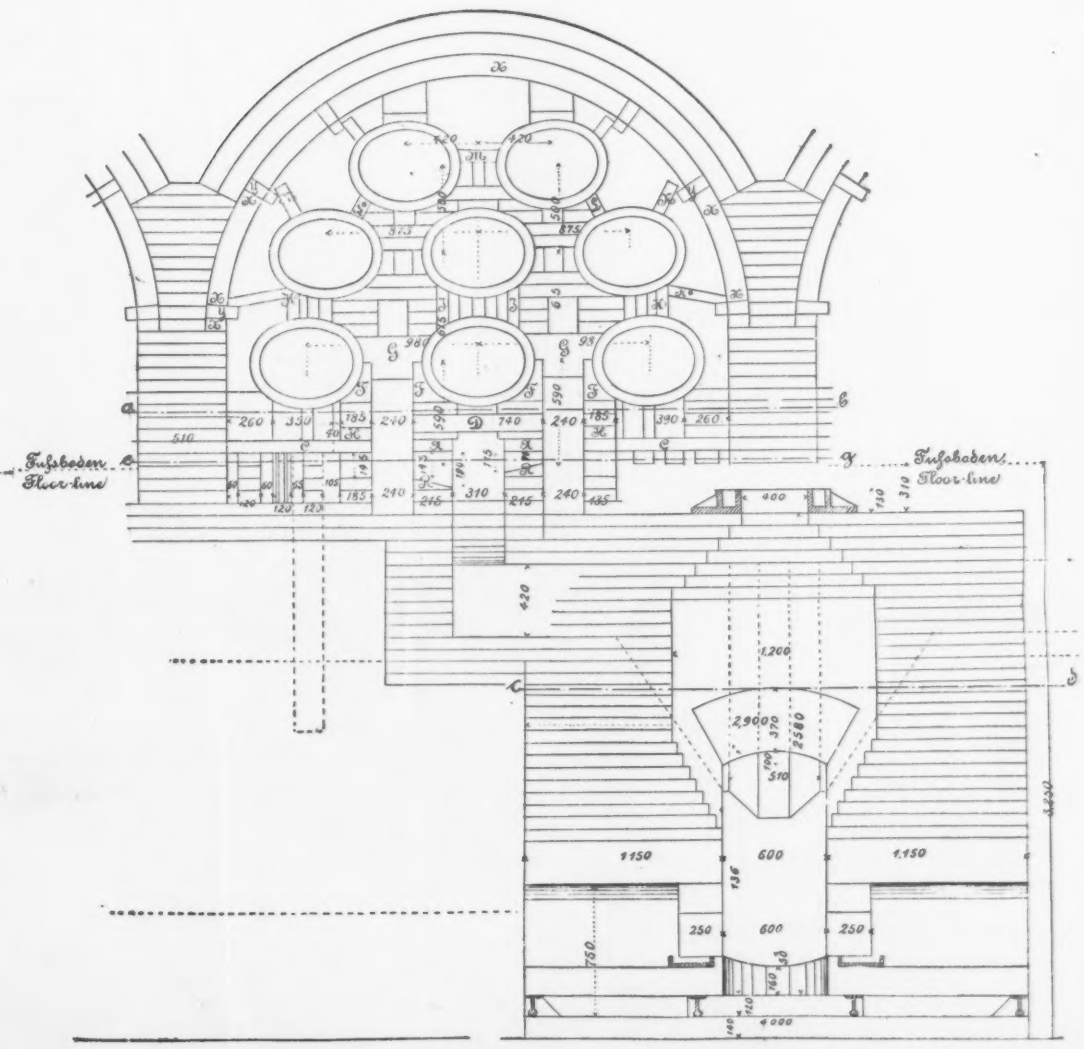


Discussion.

The Chairman—You have heard the "Wrinkles," as read by Editor Jenkins. The subjects thereof are open to discussion, and the addition as well of new wrinkles that you may have in mind.

On motion of Mr. Callender, a vote of thanks to Editor Jenkins for his excellent work was adopted.

Mr. Callender—I move that Mr. Jenkins be re-elected Editor of the Wrinkle Department.

Mr. Jenkins—Before the motion is entertained let me say when I accepted this position two years ago it was with the understanding, between the Association and myself, that two years' service would entitle the Editor to a medal and to retirement. Having so much work in hand for several months it will be impossible for me to attend to the Wrinkle duties another year. I, therefore, ask you not to insist upon this motion.

Mr. Callender—At the request of Mr. Jenkins I withdraw the motion.

The Chairman—Mr. Jenkins I fear means what he says, for he hitherto told me that which he now states to the Association. We will have to elect an Editor for the Wrinkle Department before the meeting closes, but I think it will be well to take until after dinner to determine who shall succeed Mr. Jenkins. The next thing on the programme is the

REPORT OF COMMITTEE ON ISOLATED GENERATORS FOR BENCH FIRING.

Mr. Copley—I understand there are three separate and distinct reports by this Committee. It seems to me it would be better to have the three reports read before the discussion is started.

The Chairman—Such was the understanding, and that is the course we will follow.

The Chairman then introduced Mr. W. E. Steinwedell, of Quincy, Ills, who presented his determinations as follows:

Mr. Wm. Von Oechelhaeuser, the President of the German Continental Gas Association, formally installed several stacks of benches having isolated generators in the various works under his control, one generator serving two benches.

This is illustrated and described in "King's Treatise," Vol. I., pages 233 to 235, and in "Schilling's Handbook of Coal Gas Lighting.' There were 8 retorts, from 9 feet 2½ inches to 9 feet 11 inches long, in an arch from 9 feet 2½ inches to 9 feet 6½ inches wide, and the height from the charging floor to the crown of the arch was 7 feet 2⅝ inches. (See diagram.)

The cost of 2 benches of 8 retorts and 1 generator was as follows:

2 arches, including foundation, bracing and building, at $600	$1,200
2 fillings for the arches, including retorts, tiling, fore and rear walls, and fire flues to the dampers, at $600	1,200
2 sets of iron work, mouthpieces, ascension pipes and hydraulic mains, at $550	1,100
1 generator	375
Total	$3,875

The cost of the pit in front of the benches is not included.

I operated these benches in Erfurt, Germany, and found that their chief disadvantage was that one bench always depended on the other. Otherwise, although no warming of the primary, and only a slight warming of the secondary, air was provided for, the benches did not operate uneconomically, the coke used for firing consisting of 16 pounds per 100 pounds coal carbonized.

There are, however, other systems having generators in front of the stack that work much better, owing to the increased warming of the secondary air; as, for instance, the Hasse-Didier system, which gives excellent results in the works at Leipsic, Germany.

Each bench has a closed generator, which receives primary air well heated and mixed with steam, and secondary air thoroughly heated when it enters the combustion chamber. These benches use only 14.5 to 15 pounds of coke for firing, and are built by the Stettin Fireclay Company, formerly Didier, in Stettin, Germany. The same furnace is also used with inclined retort settings, which are constantly coming into more extended use in the larger works of Europe. In Munich there is a bench having an isolated generator that works well.

Mr. von Oechelhaeuser's benches having isolated generators have been replaced by a full-depth, regenerative bench of nine retorts, which is the most modern in Europe, and similar to the construction employed by Joly and Kloenne. The leading features of this new bench are:

First, that every bench has its own generator; second, that this generator lies in the arch of the bench; and, third, that the furnace doors are at the back of the bench, which is much better for the stokers and facilitates clinkering and observation.

The cost of one arch, filling, ironwork, hydraulic main, and gas and tar pipes, is 12,850 marks, or $3,064.70, and the coke necessary for firing consists of only 14 pounds per 100 pounds coal carbonized.

This is not a result obtained with the retorts as full and the bench as warm as possible; but is the average percentage of daily practice.

One generator for two benches is also objectional in case one bench only is required, unless a good fireclay valve is provided for cutting off the supply of primary air to the bench not in use.

I prefer a stack with each bench having its own generator and hydraulic main, so that when a bench is out of use its generator and hydraulic are isolated, thus facilitating repairs, and reducing the danger of explosions.

The Chairman introduced Mr. Fred. Bredel, of Milwaukee, Wis., who read the following:

The first experiments with isolated generators were made at Westminster, England, and at Paris, France, in the early seventies. These were erected after the well-known Siemens system and under the direction of Messrs. F. R. and C. H. W. Siemens.

For members who do not know the Siemens system, I wish to say that it mainly consists of a generator, gas flue condenser and four chambers filled with checker work, similar to the way superheaters of a water gas apparatus are filled. Two of these are for gas and two for air. The products of combustion pass through the reversing valve alternately into one or the other side of the two regenerator chambers. The waste products pass through one set of regenerators and the gas from the generator and the air passes through the other, naturally, each one through its own regenerator. Both gas and air are thereby superheated to about the temperature of the waste gases as they leave the retort setting which ranges from between 1,100° and 1,400° C. The waste gases leave the recuperator at about 300° C. This shows, as far as the theoretical efficiency is concerned, that the effect of this system must be tremendous, but the great drawback is; first, the enormous self cost; second, the necessity of reversing. And besides, as far as fuel results are concerned, they are, notwithstanding all theoretical ideas, very far below the results obtained with recuperative furnaces where each bench had its own generator, thereby not requiring the reheating of the generator gas.

The system Mueller-Eichelbrenner was even then far superior, as far as the results were concerned, to the Siemens. From that time on a great many trials have been made with isolated generators and a lot of money sunk in them.

To better understand the advantage of one or the other system it is first necessary to ask ourselves: What do we want from a retort furnace? First, cheapness of first cost; second, small repair account; third, absolute reliability; fourth, economy in fuel. In considering all this, and comparing isolated generator furnaces with recuperative furnaces of present construction, I have come to the following conclusions: As regards the first point, I have very great doubt if a good system could be built at as low a cost as a recuperative bench; second, the repairs might be about the same in both systems; third, isolated generators are very unreliable, and fourth, as regards fuel consumption, they cannot come up to the benches with independent generators. To prove this I will try to give the reasons therefore. The idea of isolated generators looks at first very favorable and, therefore, it is not to be wondered at that such a lot of prominent gas men have taken up the notion of trying them. "Yours truly" was fooled to a certain extent himself, and erected a plant at the Erie (Pa.) gas works. I knew at the time that as far as fuel was concerned we could not touch a recuperative bench, but thought that where cheap coal could be obtained it would possibly pay. I will herewith give a brief description of the benches erected in Erie. The benches were supplied with a recuperator and a gas inlet. The gas flues were covered up with plates, with gas nostrils to regulate the amount of gas to be admitted at certain places of the benches. The generators, laid outside, were two in number and connected with a lined iron flue and valve to each bench. (The cut shows the construction.) The generator had forced draft which was supplied by a Koerting steam injector. We fired the benches up and commenced to run them and struck a snag immediately.

The way the bench had to be run was by adjusting the draft of the chimney which would naturally determine the amount of products of combustion going through in a certain time. It was then found out gas could not be produced in the generator in an absolutely steady stream, so that the bench might be running all right for two or three minutes, and then, as the pressure on the generator increased or decreased, more or less gas was admitted through the nostrils, and the

heat would jump in the bench continuously; and not only that, but it would run back and forth—*i. e.*, now the front end of the bench would be hot, the next time the whole bench would be hot, and then the rear of the bench would be hot.

We tried to cover up the nostrils so as to admit just a certain amount of gas, but found it would not work. The moment there was a small deficiency of gas, naturally more air would enter through the recuperator and cool the whole thing off, and as this would also cool the recuperator off, a large quantity of air would immediately pass through the recuperator, on account of the contraction of the volume of the air by cooling it, and so the benches were a continuous piece of anxiety, as you never could depend on them. To make matters worse, the main inlet pipe got choked up with tar and lampblack, mainly the latter. The nostrils deposited a lot of carbon on account of the gas being superheated, although not heated enough to prevent this depositing of carbon, and we had to fall back on running the generators with coke. The benches ran a trifle more regular then and were not quite so cranky. The fuel results were fair, but about 15 per cent. to 20 per cent. more than could have been obtained with a first-class recuperative bench.

We then made a change in the generator and inserted cleaning holes in the entire flues and all over, and we got somewhat more even results with the benches. The benches were under operation something like two years before they were let down. What I learned was this: If coal should be fired in the generator it is absolutely necessary to cool the gas thoroughly after it leaves the generator, and also, if possible, to scrub it—*i. e.*, take all the tar and lampblack out of it, and any ammonia that might be in it, and recover the by-products that way.

In steel works a large riser and overhead cooling pipe of large diameter are used for that purpose, as otherwise it would choke up all the valves. If it is a question of firing with coke, where local conditions allow, a recuperative bench, with its own independent generator, should be given the preference every time. It is by no means cheaper to build benches with isolated generators than to build an ordinary recuperative bench. This may look to you a somewhat risque statement, but I have built them and have had the experience.

In looking at the thing from a theoretical point, and asking what is wanted from the retort bench and what determines its efficiency, my answer is, the initial flame temperature and not the amount of heat obtained. In heating the retort, any heat below about 1,100° C. or 2,000° F. is of absolutely no use—*i. e.*, if the flame temperature was not higher we could put any quantity of heat around the retort and we would not be able to carbonize our coal as needed. So, therefore, the bench which obtains the highest flame temperature is the most economical.

If we fire with isolated generators, all the heat contained in the gas as it leaves the generator is lost; or, in other words, the generator gas must be cooled down, and as this is quite an enormous quantity, on account of the nitrogen which has to be taken along, you will see that the initial flame temperature is lowered that much. This explains why an isolated generator can never work as well as a recuperative furnace.

Some one might ask why not reheat the gas; that is very easily said, but it is not done so quickly. The reheating of the gas would have to be done in an absolutely tight recuperator, as the smallest leak would immediately produce the tremendous heat and destroy the recuperator. The only other way it could be done is on the Siemens or reversing system, and that would be altogether too expensive an affair to put up, and too delicate a piece of machinery to run in a gas works. In a steel works, where the heater, whose wages range from $5 to $10 per day, takes charge, this is an entirely different proposition.

It might be asked why cool the gas down? I have stated the reason why it is necessary to cool the gas down when using coal and when using gas house coke, which always contains a little tar out of the mouthpieces and is liable to stop up the flues. The only thing would be to use furnace coke, and then it becomes necessary to cool the gas down, for the simple reason that the gas has to be regulated by a valve, and this valve must be shut absolutely gas tight when the bench is not in operation to prevent explosion in the bench, and, therefore, these valves have all to be made of iron, and everyone knows that if the gas should enter with any perceptible heat, these valves could not be kept in order.

Again the question might be put, "Why are they a success in steel works, and why cannot they, with some improvements, be made a success in gas works?" I wish to answer this question by stating a few points about steel works, having myself worked while in Germany in a steel works as melting master, where I had full control of the firing of the generators and of all the Siemens open hearth and crucible furnaces. In a gas works a bench has to run 365 days steady in any ordinary year and 366 in a leap year; in a steel works they are let down every once in a while for cleaning. The practice in this country being to clean all the flues every week, I would like to see the gas works which would shut down every week. It would simply mean a considerably larger holder capacity and a larger generating capacity, as the benches would have to do in six days what they now do in seven. In England, where part of the works are closed down on Sunday, or at least were some years ago when I was there, it might be different; but here, where the rule is to work 24 hours each and every day, I am afraid it would not work.

Another objection to isolated generators is that a duplicate set of two generators would have to be used, for if it should become necessary to repair one set the whole stack to which it is connected would immediately become useless.

In making isolated generators it is absolutely necessary, in order to get anything like an even production of gas, to use two generators to the set, so that when one is burning low the other can be burning high. It might be said one advantage of these isolated generators is that, as the gas has to be cooled down anyhow, a larger amount of water could be used in the generator and decomposed into hydrogen and get a generator gas running high in hydrogen. This again is not practical, as hydrogen when burning takes up a tremendous volume for every unit obtained, and besides the flame temperature is not as high as of CO.

In an open hearth steel furnace where there is an enormous combustion chamber the flame does not count much, but in a gas furnace where the combustion chamber is comparatively small (less than .10 for the same amount of heat developed than in the Siemens furnace) this process won't do.

It might be asked why don't they build steel furnaces and glass furnaces on the same principle as our recuperative furnaces. I will answer this question by saying that a recuperator such as we use would be immediately filled up with slag and cinders. For a crucible and heating furnace this is different, and I have myself built such a furnace and have got better results than were ever obtained with the Siemens, but it is very important to see to it that no slag gets into the recuperator.

I have made inquiries in different gas works, where they have used isolated generators, on the other side, and have as yet not been able to obtain any favorable report anywhere. The reports mainly are of the following nature: "We have been working with isolated generators and they have been so far satisfactory, but we have to make some improvements on them to make them a good success." And it is always this "but" which is against them. The following is an extract from a letter received from Mr. Wm. Foulis, Glasgow, Scotland:

"In reply to your favor of the 23d inst. All our ovens here are heated with outside producers, one to each oven. I have had the idea of heating a number of ovens from one producer for a long time. In 1896, in an address to the Institution of Gas Engineers, in referring to the use of regenerative furnaces, I remarked as follows:

"A further development and improvement of this system will, I think, be found in having producers of large size, altogether separate from the retort benches; the gas being led in properly constructed flues to the various retort ovens, and possibly also to other parts of the works where heating or power is required. These producers might be supplied with forced draught, and so arranged that one or more of them would always be in condition of maximum efficiency.

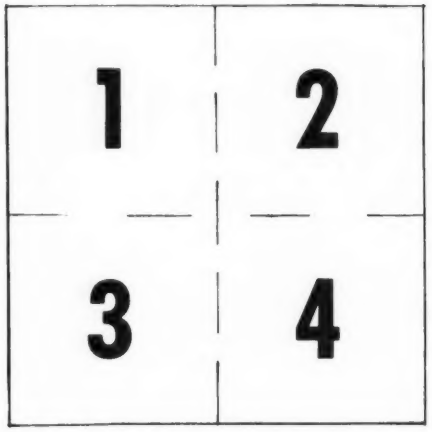
"The only movements which I know of that have since been made in this direction are some experiments at the South Metropolitan gas works. I do not know with what success. I had no opportunity until about six months ago of putting the idea into practical use.

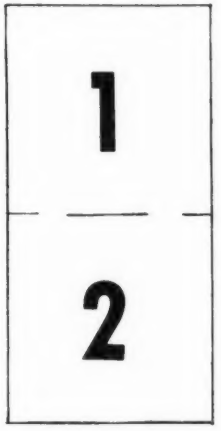
"Three producers were then erected outside of the retort houses at our Dawsholm works. These communicated by means of flues with a bench containing 16 ovens of 12 retorts each, or 192 retorts in all. They have been at work all the winter with very promising results. One or two alterations of detail will require to be made to meet the difficulty of dealing with our coke, which, containing from 15 to 20 per cent. of ash, is difficult to deal with in any producer.

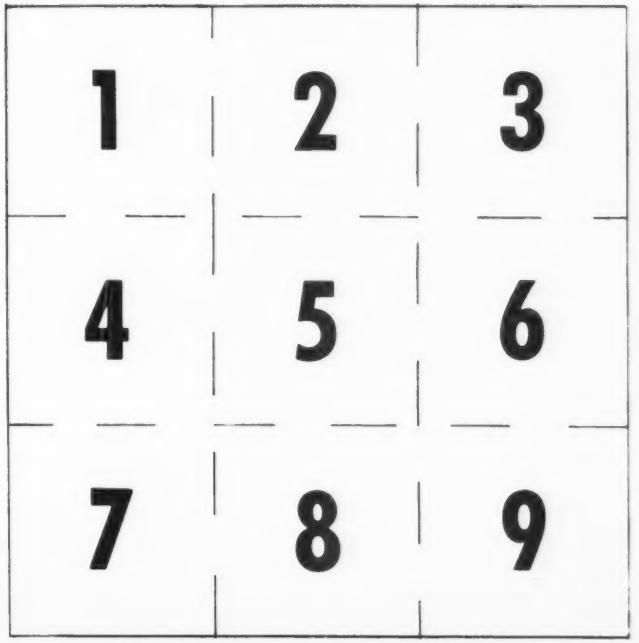
"These alterations will be completed within the next fortnight, when I will be able to give you the results obtained. Complete success is, I think, certain, and I hope before long to have a large section of our retorts heated in this way."

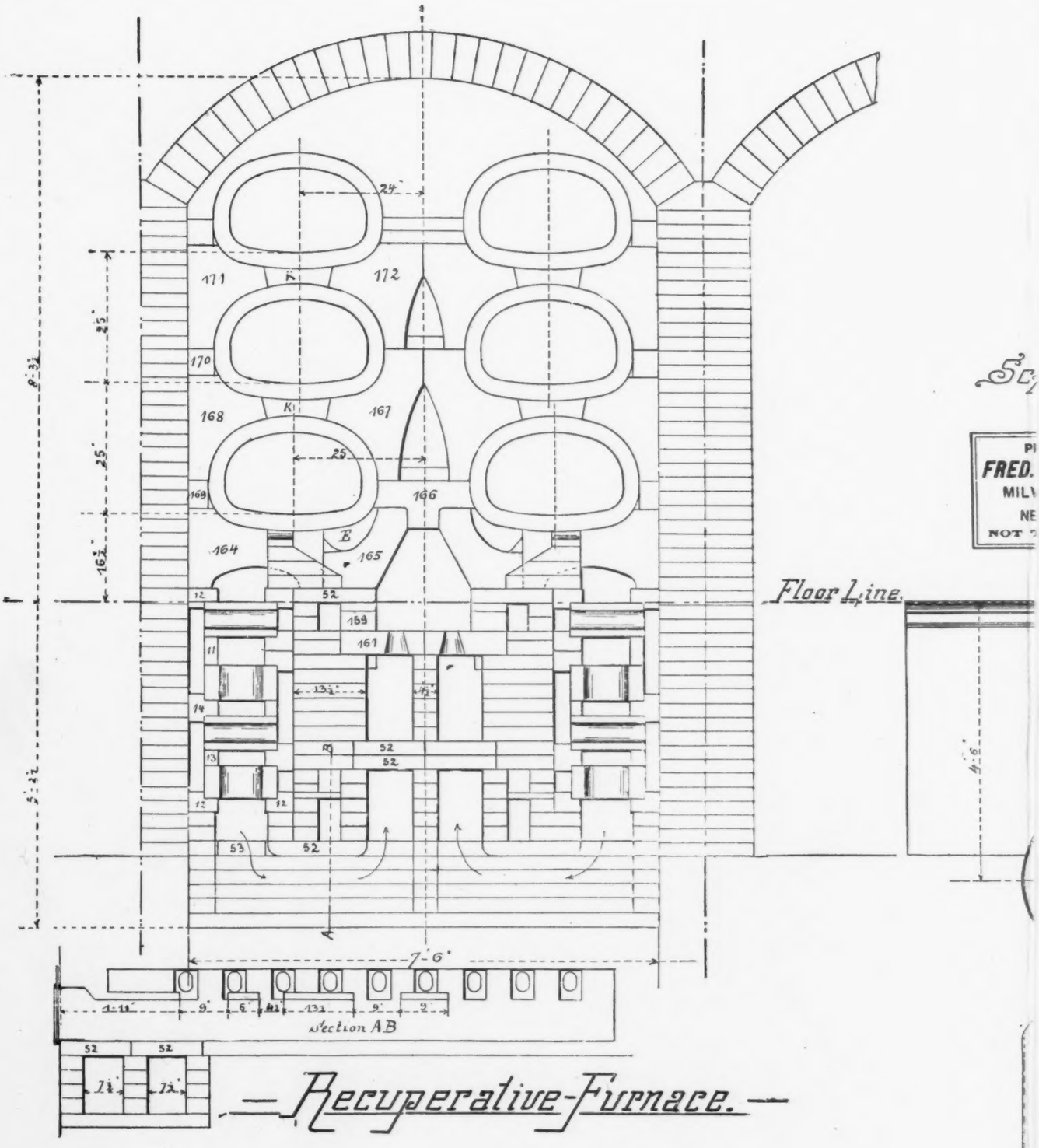
I am sorry to state that I have not heard from Mr. Foulis since, and I should be more than pleased to hear of his success, which I rather doubt. There is always some difficulty, and when you have overcome one difficulty you discover another.

Maps on this order too large to be entirely included in one exposure are filmed clockwise beginning in the upper left hand corner, left to right and top to bottom as many frames as required. The following diagrams illustrate the method.









Recuperative-Furnace.

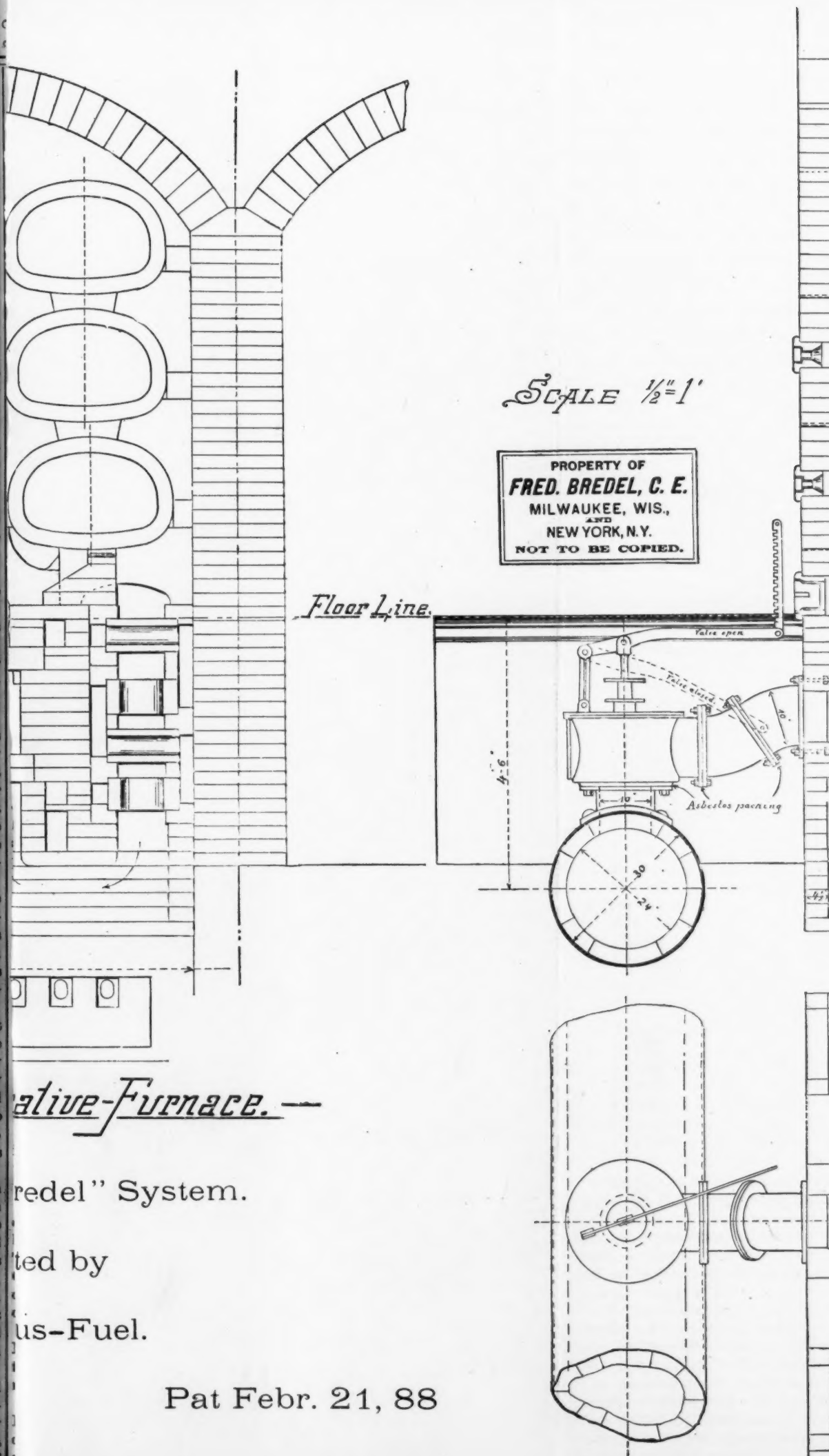
"Kloenne Bredel" System.

heated by

Gaseous-Fuel.

Milwaukee March 94 Pat Febr. 21, 88

Plan No I.d. 467.



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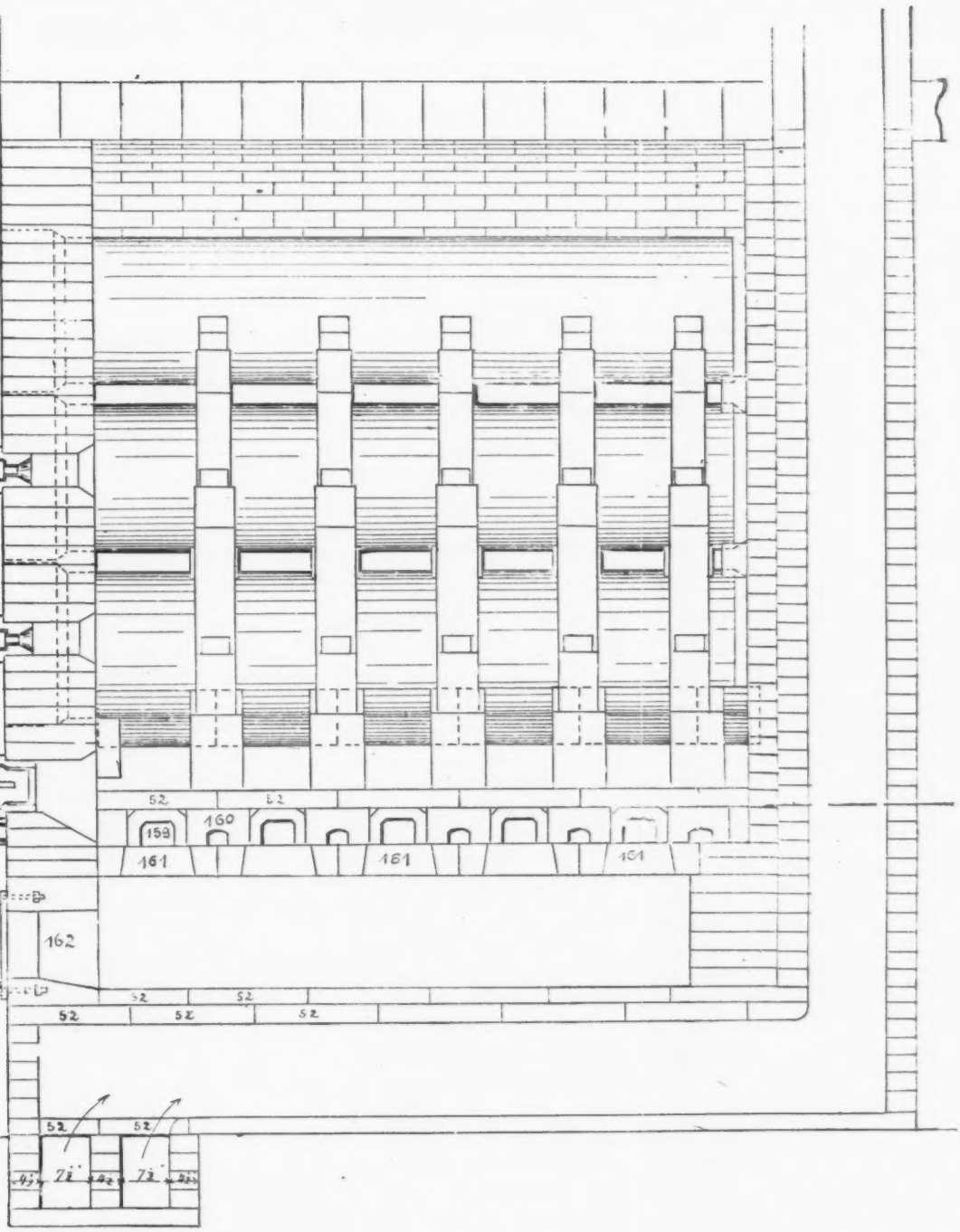
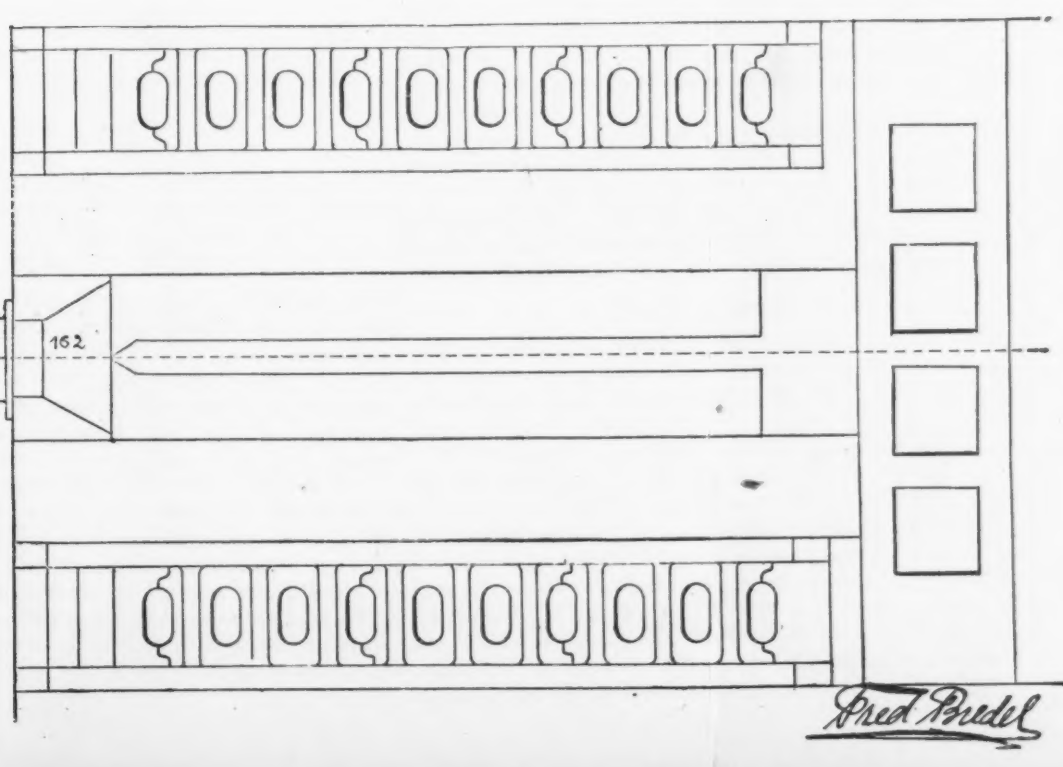




Fred Bredel

The sub-joint report of Mr. Steinwedell refers to benches where two benches are heated by one generator. Mr. August Kloenne has built two installations somewhat similar, but no more; and I must state that these were for very small gas works where one bench had two retorts and the other one.

The percentage of coke consumption in Mr. Steinwedell's report is expressed in pounds of fuel per 100 pounds of coal carbonized, as is generally done in Europe. The practice in this country is to express it in percentage of fuel of the coke made, so add to that about 50 per cent. and you get about the right average.

It must naturally be taken into consideration that this refers to German and not American coal. Some of the German coal is very much easier carbonized than the American coal, and some is about as hard to carbonize. The Scotch coal, such as Rose and Pelton Main, is very much easier to carbonize than the American coal, but it will not stand such tremendous heats as are used in this country. With Middle England coal it is different.

A recuperator bench should always be built with the generator lay ing inside of the arch. Stettiner Chamotte Fabrik, who built the Munich benches with outside generator, have at last come to the conclusion that inside generators are "O. K.," and offer also benches with inside generators. To lay the generator outside of the arch is just as ridiculous as trying to heat a house with a stove put up in the back yard. Notwithstanding the tremendous recuperator used in the old-fashioned Munich benches, the results have never been better than in any other recuperator furnaces with generators inside.

A party in Germany sent me a report of the different gas works, as regards the total amount of coke made per 100 pounds of coal carbonized, and the amount of pounds used for firing per 100 pounds of coal carbonized. In the first list they have all outside generators.

	Used for Fuel.	Coke Made per 100 Pounds Coal.
Kopenhagen	14.21 pounds.	68.04 pounds.
Dresden	17.56 "	50.60 "
Leipsig	14.29 "	63.07 "
Munchen	11.80 "	52.82 "
Breslau	16.06 "	67.37 "
Dusseldorf	18.38 "	71.72 "
Chemnitz	15.32 "	54.70 "
Elberfeld	13.36 "	67.12 "
Nurnberg	13.10 "	63.09 "
Charlottenburg	16.03 "	67.68 "
Karlsruhe	15.60 "	67.03 "
Stettin	21.51 "	73.80 "
Basle	16.83 "	65.69 "
Halle	13.79 "	60.28 "
Mains	15.09 "	61.99 "
Kiel	15.76 "	63.54 "
Dawrig	32.95 "	79.18 "
Bonn	18.25 "	65.24 "

In this second list they have all used inside generators:

	Used for Fuel.	Coke Made per 100 Pounds Coal Carbonized.
Kaiserslautern	11.19 pounds.	68.24 pounds.
Trier	11.11 "	58.84 "
Colmar	10.99 "	68.37 "
Barmen	13.00 "	68.45 "
Strassburg	15.00 "	68.00 "
Wiesbaden	12.89 "	67.00 "
Bochum	12.00 "	68.00 "
Posen	11.00 "	70.00 "

It will be seen by this statement that the best result with outside generators was 11.8 pounds, while four works with inside generators had better results. I would remark that the variation in the amount of fuel used is somewhat different as to the different coal used. For instance, Ruhr coal used about the same amount of fuel as the American coal, while Saar coal will use considerably less. The results, therefore, have to be taken as a whole, and not in pieces, and it will then be seen that the inside generators work better than the outside, and if that is already the case with a generator which lays directly in front of the bench, what must be the result if the generator lays from 60 to 100 or 200 feet away from it where the gas becomes cooled down?

In speaking about recuperative furnaces in this report, I wish it understood that I refer each time to the recuperator bench and not to the so-called half-depth and other benches, which have all the disadvantages of the recuperator and free fire bench with none of the redeeming points of either.

I wish also to call the attention of the members to a very interesting paper, read at the General Meeting of the Civil Engineers (England), May 2d and 3d, by Mr. G. P. Lewis, published in the *Journal of Gas Lighting*, May 16, 1899, page 1271.

Mr. Irvin Butterworth, of Columbus, Ohio, speaking as the third member of the Committee, said: I owe it to myself to say I was named to membership on the Committee at a comparatively recent time, and to complete the requisite number of members, through a misunderstanding over the personnel of the Committee originally appointed. There have been no meetings of the Committee, and practically no interchange of opinion between its members by correspondence. I did not know until a few days ago that each member of the Committee was expected to submit an individual report, instead of a Committee's report as a whole. I obtained copies of the individual reports of my fellow committeemen only a day or two ago, and although I find that I differ with them in their conclusions I have not had time to prepare what might be called a minority paper. I will say, however, that, as the result of the slight examination I have given this question, the facts that isolated generators for bench firing are now working with reasonable success, and that many good gas engineers, some of whom are using them in their own works, have faith in them, indicate to me there are two sides to this question, and that this system of bench firing may be susceptible of development and improvement to the great advantage of gas companies. Mr. Steinwedell admits that "In Munich there is a bench having an isolated generator that works well;" and Mr. Bredel's statement shows that Mr. Foulis, of Glasgow, who has had experience in and is a student of this subject, has great faith in the efficacy and economy of isolated producers. We all know that Mr. Carpenter, of the South Metropolitan Works, London, advocates them after several years of experience. Dr. Schniewind, the Engineer of the United Gas and Coke Company's by-product works at Everett, Mass., is also a firm believer in them.

Some of the objections that Mr. Bredel urges against isolated generators are based on mechanical difficulties, such as the preventing of stoppages in pipes and flues, providing valves that will stand high heats, etc. We all know that purely mechanical difficulties can generally be overcome, and it is well known that many of the most successful devices now in use are the results of experiment and development that began in failure. Isolated producers, however, although their development has practically but just begun, have already met with a greater measure of success than is usual in radical departures of this sort.

It seems to me that one large outside producer, or, say, two large ones (one being in reserve), situated, if found desirable, to receive hot coke direct from the retorts, may be found, when we learn how to properly construct and operate them, more economical in first cost and in operation for heating a stack of retorts than is the ordinary wasteful arrangement of an individual generator under each bench.

The gas produced by the individual inside generators as now generally operated must certainly fluctuate greatly in quality and in the degree of economy of its production, while the large outside producer, managed by one skillful operator, with a low grade of fuel, if desired, would yield a gas of uniform quality, produced at all times with maximum economy.

I regret that I cannot back my opinions at this time, and on this short notice, by the presentation of a mass of figures and technical data like those of my colleagues, but I am still constrained to say that isolated generators are well worth further experiment and development, and offer a good fighting chance for the reduction of first cost and operating expense in retort house construction and practice.

Discussion.

The Chairman—I presume you all understand the situation respecting the misunderstanding on the part of the Committee as to how their joint report should be submitted. The three presentments are now before you for discussion.

Mr. Bredel—The report of proceedings by the official stenographer showed that Mr. B. E. Chollar was a member of this Committee, and not Mr. Butterworth. I only knew about two months ago that Mr. Butterworth was on the Committee, and as he has practically opened the discussion instead of putting in a report, I would like to answer him. Mr. Butterworth thinks it is practicable to put in and use outside generators. What his idea of that is I do not know. Certainly the only theoretical advantage that could be claimed would be that one could thereby lower the first cost; but that is impossible, and I know it. As to the results obtained in Glasgow, let me say that if any of you

gentlemen had to put up a bench like that in this country you would have to pass dividends for quite a while. The plan and practice are too expensive. Mr. Butterworth speaks about the results obtained in Munich. Some of the Munich benches were good and some were not, the proportion rather going to favor the latter clause of my assertion. After all, the reports from Europe show that the place for the generator is inside, and I believe I have shown conclusively it is theoretically impossible to get as good results with outside as with inside generators. We all know that that which is theoretically impossible is practically impossible, but we further know that some things are theoretically possible which are quite impossible to bring about practically. As to the reported results obtained in England by Mr. Carpenter, I may say these things depend altogether upon what one is satisfied with. Many of you are satisfied with benches that consume 33 per cent. of fuel, but an isolated generator will not improve your position. As to Mr. Schniewind's experience, I may say he never built a gas works. He only knows about coke making. His designs regarding gas benches are modifications of the Siemens bench.

Mr. Doherty—Mr. Bredel has evidently satisfied himself by his own report, but I do not think he has proven that theoretically this method is impractical. If he will prove that theoretically it is impossible I will be ready to sit down. He has proved that *theoretically it is possible.* He admits the wonderful saving that might be made. If we had abandoned the gas business because of the few difficulties that stood in the road in the early days (or stood in the road of those who went before us) there would be no gas business to-day; it would have been abandoned as impracticable. Mr. Bredel stands to-day just where he stood a year ago. He has not changed his views at all. Without any injustice to him I think I can say that his report shows he has a predisposed prejudice to the system. He also makes the statement that this system cannot be built cheaper. Less material would be required, and it would not have to be put up in tight joints, therefore it could be put up much cheaper. Again, he neglects in his calculations the greatest factor in America, that of labor. Even if we get greater fuel economy with our present methods, yet our cost may be more. If we could save in labor it might counterbalance increased cost in fuel, although I do not think that an outside generator for several benches would require more fuel than one inside the arches. If we are to discuss but one generator, which lies outside of the arches, and yet supplies only that one bench, then I think many of Mr. Bredel's statements may be justified; otherwise I do not. I do not think we are justified in assuming that the gas has to be cooled and scrubbed. Mr. Bredel forgets that water gas men are using valves for heated gas right along, and that they are as tight as are necessary for this system. Another important consideration he neglects is the length of time that a bench will last when fired with gas. I believe our benches are depreciated more by the effect of firing and clinkering in opening the door and allowing the cold air to come in contact with them, and by the destructive effect of the flame (which cannot be controlled so well by individual generators as it can be by sets of this sort) than they are by the actual operations inside. There are many points that I am sorry Mr. Bredel has treated the way he has. It seems to me like an attempt to dismiss the subject without any further consideration or investigation. He speaks about the variable gas that will be made by the producer. Now in former trials it was a mistake, I think, to use a steam-jet injector unless that was controlled by a governor on the outlet of the producer. We all know that in firing soft coal the resistance in our fuel bed is going to change constantly, and we have serious reason to believe that it will change even when coke is used; certainly with soft coal with a tendency to coke the resistance will change rapidly. He has used a generator in which he has put in a heavy charge of soft coal at one time. It is true he has tried to compensate for that, but still I do not believe it is scientifically correct, or that it would be good practice to charge a soft coal producer with coal in periodical charges. We should introduce it more uniformly, as with a worm, or some other method of that sort. Mr. Bredel in bringing up the matter of the temperature or kind of flame that is most economical or best says that the fuel with the highest flame temperature is the best. I think that also is a mistake. There is such a thing as getting the flame temperature too high. We all use more or less hydrogen gas in our furnaces, that is, we all use water to keep down the intensity of heat in the producer gas furnace. Now if we can burn any hydrogen gas in our bench to advantage, we can burn more of it, and that hydrogen gas will act to distribute our heat. In other words, it will tend to make our heat more uniform all through the bench. He also says that the repairs might be the same in both systems. I think the repairs would be materially less. I can keep a chamber in repair which is filled with loose checker brick cheaper than I can keep two thin walled flues adjoining each other in repair, which must be maintained airtight. We must consider the greater efficiency of firebrick exposed to the direct action of the waste products of combustion. The checker work absorbs heat by actual contact. In the present system, since you have to pass the heat through a 2-inch brick wall at least, and as we know that firebrick is a good non conductor of heat, therefore, the latter system takes more material, and that material costs more to put it in. The generator fuel bed, if fed by a worm or something of that sort, can be maintained at the same height. If the quantity of gas produced was controlled at the outlet of the producer it would tend to make the production of gas more even; or another method that might be resorted to, to make the regenerator work the same all the time, would be to have a positive blower that would pump a positive quantity rather than exert a uniform inductive influence. In two or three instances Mr. Bredel generalizes. In one instance he says that the loss of heat in cooling and scrubbing the gas would be enormous. I do not agree with Mr. Bredel in this. I am satisfied that a producer can be built, and the gas made and cooled, and that the loss of heat will be less than 10 per cent. of the heat of the gas. I believe that in every system that Mr. Bredel speaks of they have used cold air to fire the producer. If preheated air from the regenerators were used it would enable more steam to be used in the producer, which would be an advantage if you were going to cool the gas, as it would give you a gas of higher calorific value, and the sensible heat of that gas would bear a much smaller percentage to the total heat than in the case where you use a producer in the ordinary way. I have made some rough figures on the back of the sheet which I have in my hand which show that producer gas (if Mr. Bredel's temperatures are right, and if my calculations are right) would have about 2,800 heat units per pound, and the sensible heat in the gases coming out of the producer would be about 10 per cent. of that. Then, in cooling and scrubbing, we would recover the by-products, which would, I think, more than pay for the cost and loss in cooling and scrubbing the gas. I am not familiar with the Dowson process used in England, but I have seen some very sensational reports of the amount of ammonia produced. I think we might expect at least 3 pounds of ammonia per ton of coal, which, at 5 cents per pound, would more than pay for the loss in sensible heat. I do not think Mr. Bredel is justified in saying that a class of machinery which is run every day in a steel works is beyond the reach of gas men. If any men ought to be able to run gas machinery it is the members of our various Associations. They certainly have the education. I occasionally take the liberty of criticising gas men, but I do so to strengthen certain of my arguments; but my sympathies are with the gas men, and I will always bet my money on them. If steel works can afford to pay a man $10 per day for gas making, then the gas company can afford to do the same thing, if that is necessary; but when a gas man at $1.80 or $2 per day can run a water gas machine, which is certainly just as complicated, and a good deal more so when you take into consideration the carburation of the gas, and things of that sort, I am quite sure we shall have no trouble in finding competent men.

Mr. Bredel—I did not say that. I said, "With another generator." There is a great difference.

Mr. Doherty—I am now arguing from the standpoint of an admission, or, rather, the supposition that you are right in your belief that the gas has to be cooled. Now, I can prove beyond the shadow of a doubt that any kind of an ordinary mechanic can fire gas in a bench successfully. And, what is more, it requires practically no attention if your pressure is constant, as it can be kept and very easily, and we have been able to do this right along. If our combustion chamber is too small in our benches as now constructed, then build them larger, if we are going to introduce a new system; but I do not think they will prove too small. Mr. Bredel sarcastically refers to the placing of the generator on the outside of the arch as being as ridiculous as would be the putting of a furnace in the back yard to heat our house. But that is just what we are doing right along, in effect, for we are putting our stoves in the basement, or are putting them in the back yard under shelter. His argument would be that we must put a stove in every room. I think some of the points that Mr. Bredel brought out are much stronger than his example, but his example was intended to impress the members here. It seems to me, however, that his example tends to support my side of the question rather than his. I do not think that the cooling effect upon flues 100 feet long is to be apprehended. I do not think their length would be apt to be more than that in an ordinary gas works. But suppose they are 600 feet long. We must remember that the loss would be the heat transmitted through a brick wall which has been built specially to prevent transmission. I do not think any of us here would expect to get very high

results if we were using that flue as a condenser. I think we would find that the transmission of heat through its walls would be very small. I admit that the temperature to move it would be considerably less; but the radiation of heat from a firebrick flue, built to prevent the radiation of heat, is certainly not a large factor. Pretty nearly everything that has been tried in the gas business has proved a failure at first. The first man who proposed clay retorts got "the laugh." Large holders were unsuccessful at first. Numerous other things have been unsuccessful. And I have no doubt Mr. Bredel can cite failures in his own case—as at Erie. I do not think, however, that a few failures prove the matter, for I think any gentleman here can see reasons why he would be liable to have trouble with the system installed at Erie. If such an able engineer as Mr. Foulis is so confident of success with this system, I think, to say the least, it deserves further consideration. I will also say that the present bench fuel consumption in ordinary gas works, where they realize a good price for their by-products, often amounts to one half the cost of the gas. Again, if one man is going to take care of the producer, and can be responsible for the firing of every bench in the gas works, he will be very apt to get much better results than when running individual generators, and where there is no responsibility for the fuel used or the gas made. This system will also permit the use of very cheap fuel in some cases. I know some cities where coal can be used for the producer which sells for $1.30 per ton, while coke in that same town sells for $7 per ton. I also think we can get far below 300° C. in the outgoing gases if we use the reversible system. If we could get down to 300° F. the saving would be very considerable. We can never hope to get anything like those figures as long as we use the closed recuperator. Here are some figures which I have made hastily. In working with this system the ability to use a cheaper grade of fuel would amount to not less than 50 cents per ton. There would be a considerable saving in the handling of the fuel. I think we could get the credit for ammonia which I have already mentioned. There would be a saving in the first cost of apparatus, the repairs would be reduced, and the labor likewise. No figures are given in Mr. Bredel's report as to the labor item, but I think it would be materially less; in all I think we would save not less than 60 cents per ton on present basis. Another point which comes in, and which perhaps may be a little remote, is this: In the last 18 months there have been a number of installations made of gas engines for driving electrical generators, and in a great many other cities the gas and electric companies are fast coming together. There are many places where producer gas, if made in large quantities, could be made so cheaply that steam could not compete with it on the efficiencies which are being guaranteed by certain gas engine manufacturers; but where you have to make a small amount of producer gas, it would be impossible to furnish it as cheaply as it ought to be made; but in manufacturing in large quantities it would be cheaper than steam. I will conclude by saying that I hope the interest in this subject will be maintained, and that a committee will be appointed by the Association to carry on this investigation. I am prejudiced in favor of it as compared with our present system. I do not want to be a member of that committee. I also think it would be better if Mr. Bredel would take the floor on this subject, instead of the committee, at our next meeting; and then if that committee reports in favor of it the opposing side will be represented by an able, intelligent and educated engineer, whom I have great faith in, but whom I think is very prejudiced. If no one wants to defend the other side I will be very glad to take that side up and to defend it as best I can. I think we ought to give the subject more consideration than is given in the reports which have been presented, and I think it should be done by members entirely unprejudiced. I confess that I am a little prejudiced.

At this point a recess, until 2 P.M., was ordered.

[To be Continued.]

Tarred Macadam.

Engineering Record says that tarred Macadam, a class of pavement which has been steadily gaining in favor in Great Britain, has been laid in Hamilton, Ontario, under the direction of City Engineer E. G. Barrow, at a cost of about 76 cents per square yard. The nature of the work is shown by the specifications, which read as follows:

"All earth or other material above the sub-grade shall be excavated, so as to conform to the level of the sub-grade, which will be 12 inches below the finished surface of the roadway; and should the sub-grade be above the level of the natural ground, then earth shall be deposited until the level of the sub grade is reached. The sub grade shall be shaped to the profile and cross-section which will be furnished by the City Engineer.

"After the sub grade has been formed to the proper camber of the road, then it shall be thoroughly rolled with the steam road roller; and if by this means soft spots are revealed they shall be filled with good solid material. The first 6 inches shall be made in the ordinary way for a macadam or telford roadway thoroughly rolled. If so required, it may be made of hard broken stone, furnace clinkers or brick rolled smooth and finished to the required camber of the road. Upon this shall be placed the tarred stone. The first layer—4 inches thick—to be composed of stones capable of passing through a 2-inch ring. On this a layer composed of fine gravel or quarry clippings, ¾-inches thick, shall be placed, and well rolled in so as to fill all interstices. Before finishing, a dressing of screenings shall be scattered broadcast to be worked in by the traffic. All these layers except the last shall be thoroughly compacted by rolling. The stone to be tarred shall be heated on an iron floor, under which are flues from a fire, until the moisture is driven out. The material in its heated state is then to be thoroughly mixed with a sufficient quantity of tar. The tar should be boiled in iron kettles holding 50 imperial gallons, to which should be added a bucket full of pitch. Eight imperial gallons should be added to each cubic yard of the coarser material; and 10 to 12 gallons to the finer kinds of stone. The work must be done in the summer months and all work must be suspended during wet weather."

A Self-Correcting Photometer Scale.

By MR. BUCKNER SPEED, in *Electrical World*.

In an incandescent lamp photometer in which the lamp under test is balanced against a standardized lamp, it is usually necessary to multiply the candle power as read on the "direct reading" photometer scale, by the candle power of the standard lamp, as the standard lamp is rarely 16-candle power, but usually a fractional value as 15.5, 16.4, etc.

The slide rule scale shown in the cut has been applied to a standard lamp photometer by the writer and by means of it the candle powers of the lamps being run through test, can be read off directly without any corrections, and with great rapidity.

The pointer at B in the cut is fastened to the screen carriage and moves along an ordinary "direct reading" photometer scale, graduated so that when the pointer is half way between the lights the scale division would be 16 candle power. No numbers are put on this scale, however, but the division points are carried by slightly oblique lines down to a readjustment of their spacing which changes them into the points of a logarithmic scale.

Immediately below the bottom of the oblique lines is a similar logarithmic scale ruled on the upper and lower edges of a slide, while below the lower scale is a fixed pointer A, which is fixed directly below the pointer B, when it is at the position half way between the lights.

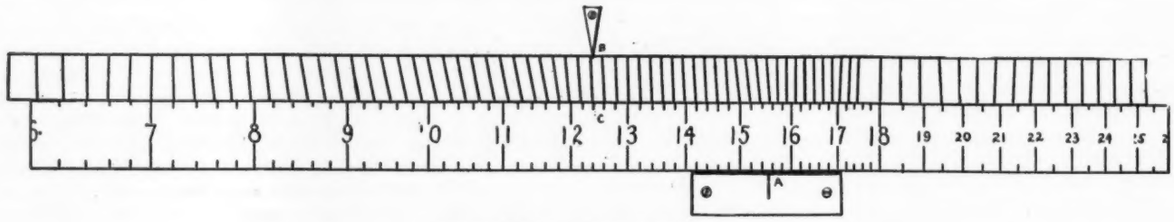
To set the scale for direct reading of the corrected candle power, the slider is moved along until the pointer A is pointing the candle power of the standard lamp. In the cut this is supposed to be 15.50 candle power. This position of the slide is not changed unless another standard lamp with a different candle power is used.

The screen carriage is now set as in the ordinary way, and the position of its pointer C is carried down by means of the oblique lines and the corrected candle power read at C, which is this case is shown at 12.22-candle power. The scales shown are 15.175 inches long and are correct for a photometer bar, having a distance of 84 inches between the lights. In applying the scale to an 84-inch bar, the pointer A is set and fixed exactly half way between the lights, and the sliding scale set with 16 at the pointer A. The top scale is then adjusted so that its lower edge corresponds exactly with the rubber edge of the slide.

The positions given in the tables are calculated for the even numbers, the intermedial two-tenth divisions being interpolated. The values in the photometer scale column are found to be evaluating in the expression.

$$l = \frac{1}{\frac{\sqrt{r}}{d} + \frac{1}{a}} - 31{,}900,$$

in which l is value in column 2 of the table—that is, distances of the even divisions from division 6; r is the ratio of the intensities of the lights, and d is the distance between the lights or 84 inches; 31,900 is the distance in inches from the lamp under test to division 6.



Logarithmic Photometer Curve.

The logarithmic scale is obtained by multiplying the tabular logarithmic from 6 to 26 by 23.83 and substracting from each the log of 6.

Table for Photometer having 84 Inches Between Lights.

Even Division Numbers.	Distances of Even Divisions of Top Scale from the Beginning Point 6 (Photometric Scale) Inches.	Distances of Even Divisions of Sliding Scale from the Beginning Point 6 (Logarithmic Scale) Inches.	Even Division Numbers.	Distances of Even Divisions of Top Scale from the Beginning Point 6 (Photometric Scale) Inches.	Distances of Even Divisions of Sliding Scale from the Beginning Point 6 (Logarithmic Scale) Inches.
6	0,000	0,000	17	10,740	10,790
7	1,580	1,600	18	11,340	11,370
8	2,900	2,980	19	11,900	11,940
9	4,110	4,200	20	12,445	12,470
10	5,190	5,290	21	12,955	12,970
11	6,180	6,280	22	13,440	13,450
12	7,090	7,180	23	13,900	13,910
13	7,930	7,980	24	14,345	14,350
14	8,700	8,770	25	14,760	14,770
15	9,430	9,490	26	15,175	15,180
16	10,100	10,160			

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

AT a meeting to be held to-day the stockholders of the Ogden Gas Company, Chicago, Ills., will be asked to vote upon a proposed issue of $10,000,000 of bonds, to bear interest at the rate of 5 per cent., and to run for 40 years.

THE City Council of Los Angeles, Cal., has adopted the report of the Committee on Gas and Light, which Committee, having been charged with the matter of investigating the feasibility and good policy of engaging the city in the operation of a municipal lighting plant, recommended that no such task be undertaken.

THE Directors of the Chelsea (Mass.) Gas Light Company have declared a semi-annual dividend of 2½ per cent., payable the 15th inst.

A CORRESPONDENT at Little Rock, Ark, writing under date of the 28th June, says: "Mr. H. Allen Odell has resigned the presidency of the Pulaski Gas Light Company, of this city, and has been succeeded by Mr. Beman G. Dawes. The latter is favorably impressed with the bright prospects of Little Rock, and he has evidenced his faith by investing largely here. It is announced that Mr. L. E. Walker. of Lansing, Mich., who is prominently connected with the gas plant there, will come to Little Rock and take the active management of the manufacturing and distributing ends of the Company here. Mr. Durand Whipple will continue as Secretary of the Company. The officers and Directors of the Company are: President, Beman G. Dawes; Vice-President, S. M. Apperson; Treasurer, Oscar Davis; Secretary, Durand Whipple; General Manager, L. E. Walker; Directors, John G. Fletcher, Chas. F. Penzel, S. M. Apperson, Oscar Davis, Josiah Quincy, H. W. Bates and Beman G. Dawes. The selling price of gas under the new rate from July 1 will be $1.90 for illuminating and $1.65 for fuel, with 10 per cent. discount if bills are paid at the Company's office on or before the 10th day of the month following that during which the gas is consumed. While the net reduction is small it is more noteworthy in that the price of every article entering into the manufacture of gas has risen on an average of almost 50 per cent. during the past year. The reduction indicates a liberal spirit on the part of the Company, which cannot but result in a healthy increase in the output."

THE authorities of Fayetteville, N. C., are conferring with the proprietors of the Fayetteville Gas and Electric Light Company with a view to purchasing the latter for operation on municipal account.

THE following is the text of the report made by the sub-committee of the Committee on Finance and Light, of the Richmond (Va.) City Councils, the sub-committee having been charged with the task of determining what sum would be necessary to modernize the water gas plant of the municipal gas works:

"We, your sub committee appointed to ascertain and report the approximate cost of modernizing your water gas plant, beg leave to submit the following, viz.:

"Erect a boiler and engine room of sufficient size, with a necessary division wall, and place therein two 50 horse power engines and an oil heater; also, two No. 8 high pressure Sturtevant blowers, on adjustable hose, and rearrange with a galvanized iron pipe to overhead system, making the pipe 24 inches in diameter.

"By the above changes you will have sufficient room to move your generators back, thereby allowing space to install two carburetors, 7 feet in diameter, with reverse steam connections, water-cooled valves, and firebrick lined connections.

"Rearrange the brickwork in the superheater, enlarge the stack valve and the take-off connections from 12 to 16 inches, dispense with the present wash boxes, and replace them with those of 6 feet diameter.

"The condensing service in the present water gas plant is inadequate, therefore there should be added one 8-ft. 6-inch by 22-ft. condenser, and all connections between wash box and condensers should be not less 16 inches.

"Of course, these changes will necessitate changes of your stage floor and relining your machines.

"All of the above changes are absolutely essential in order to put the water gas plant in first-class condition; and it is necessary to do this in order to obtain the most economical results, or such as are obtained in all first-class water gas plants.

"The approximate cost of the above improvements would be about $21,500, and we recommend same for your favorable consideration and action."

THE members of the sub-committee are Joseph Wallerstein, E. W. Miner and W. P. Knowles. And it is to be regretted that they could not see their way clear towards recommending an appropriation for a storage holder in the west end of the city, which vessel would be of commanding use for the economical distribution of gas in the city of Richmond next winter.

THE Council Committee on Public Lights, Portland, Me., has determined to make a good working experiment on the streets with the Welsbach outdoor burner.

AT the annual meeting of the Kansas City, Missouri, Gas Company the officers chosen were: Directors, M. J. Payne, J. C. James, H. J. McGowan, R. M. Snyder, J. T. Holmes, Charles E. Small, Randall Morgan, Joseph Bushnell and Geo. S. Philler; President, Milton J. Payne; Vice-Presidents, Randall Morgan and J. C. James; Treasurer, Lewis Lillie; Secretary, R. MacMillan.

THE United Gas Improvement Company has secured the necessary three-fourths of the shares in the Hudson County Gas Light Company, of Hoboken, N. J., to enable it to do with the latter as its will dictates.

THE City Council of Mount Vernon, Ills., has granted a franchise for the operation of a gas works there to the projectors of the Mount Vernon Gas Company. Under the terms of the grant, work on the plant is to be commenced within 90 days and is to be completed December 1st next. This place is the capital of Jefferson county, Ills., and is about 77 miles east southeast of St. Louis, Mo., and 20 miles southeast of Centralia. It is a fairly busy place and has a population of 5,800.

THE preliminaries for the consolidation of the gas and electric lighting interests of Willimantic, Conn., having been completed, the formal reorganization is now underway. It is likely that Mr. Luther Hill will be the controlling power when the final adjustment is made.

THE plant of the Quincy (Ills.) Gas Light and Coke Company is to be rebuilt. It is also proposed to thoroughly pipe the outlying district known as Lawndale.

MR. A. S. PARMLEE has been appointed local manager of the Owego (N. Y.) Gas Light Company.

THE authorities at Middletown, N. Y., have authorized the Middletown Gas and Electric Light Company to carry on the public lighting of that place for a period of three years.

THE properties of the Phoenix (Arizona) Illuminating Gas and Electric Light Company have been formally transferred to the Phoenix Light and Fuel Company, of which concern Mr. Thomas W. Pemberton is the active man.

MR. JOHN R. MCLEAN has not resigned as President of the Washington (D. C.) Gas Company.

THE Citizens Gas and Electric Light Company, which as before stated in the JOURNAL, was formed to take over and operate the properties of the Spencer (Mass.) Gas Company, will be managed by these officers: President, Erastus Jones; Treasurer, Frank A. Drury; Secretary, Noah Sagendorph.

MR. JOHN A. BRITTON, Secretary of the Pacific Coast Gas Association, and Secretary and Treasurer of the Oakland (Cal.) Gas Light and Heat Company, together with his entire family, narrowly escaped poisoning some time ago, as the following, from the San Francisco *Examiner*, of June 24th, shows: "John A. Britton, Manager of the Oakland Gas Light and Heat Company, and his entire family were poisoned a few nights ago by eating strawberries that had not been thor oughly washed, and upon which there remained a little of the arsenic that had been sprinkled upon the berries to ward off pests during the growth of the vines and their fruiting. The poisoning was not very severe and the family recovered, but it required the services of a physician for several hours to relieve Mr. and Mrs. Britton and their three children from pain. The poison symptoms were apparent just after eating the strawberries, and all those who ate the fruit were affected. The physician who was called said the symptoms were those of arsenic poisoning, and the case is noteworthy as being the *first* instance of the kind reported in Oakland this season. Since the use of arsenic for spraying strawberry vines has become general these cases occur every year, with more or less severity."

MR. J. H. WOODSON, Superintendent of the Staunton (Va.) Gas Company, reports a good demand for appliances for the use of gas in the kitchen.

MR. CHARLES L. GEROULD on the 1st inst. assumed the duties of his new position as manager of the gas properties controlled and directed by a syndicate whose headquarters are in Portland, Me. The syndicate owns the Geneva (N. Y.) Gas Company, the Galesburg (Ills.) Gas and Electric Company, and the Michigan City (Ind.) Gas Light Company, and has a large interest in the Urbana and Champaign Gas and Electric Company, of Champaign, Ills. At Galesburg the syndicate will expend $50,000 in reconstructing the gas plant. The contract for this work has been awarded to the American Gas Company, and to Mr. Fred. Bredel. They will put, in new buildings to be erected by Messrs. Munson & Tinglief, two benches of 7's and one of 9's, and the house is to be so built that it may at a later time cover two additional benches of 9's. The contracts also call for suitable washing and condensing apparatus, purifiers and station meter. At Geneva the syndicate has contracted with the Stacey Manufacturing Company for a storage holder of 100,000 cubic feet capacity, and at Michigan City important main extensions have been arranged for.

IN the new agreement or contract between the authorities of Indianapolis, Ind., and the Indianapolis Gas Company, which is to govern their relations for 10 years, the selling rates specified are: When the output of the Company does not exceed 300,000,000 cubic feet annually, $1 per 1,000; when the annual consumption is more than 300,000,000 and less than 350,000,000, the rate is to be 95 cents per 1,000; and when the consumption reaches 350,000,000 the charge is to be 90 cents. The Company must, on January, 1900, file with the Comptroller a statement of the number of cubic feet of gas manufactured and sold during the year previous and the number of meters in use by consumers. A similar statement must be filed on the 1st day of July and the 1st day of January of each year during the continuance of the contract. In case the Board of Works is convinced at any time that such report is erroneous it has the privilege of examining any books of the Gas Company bearing on the subject. The gas to be furnished by the Company shall be of not less than 18-candle power, and the degree or rate of pressure carried or maintained is to be subject to the inspection of the Board of Works at all times, and the Board may designate an officer at any time to inspect any and all apparatus or contrivance employed by the Company in the carrying on or the furtherance of its trade. Respecting main extensions, it is provided that such must be made whenever the petitioners bind themselves to use such a number of burners that the total of the latter will average 15 for each 500 feet of space on the proposed line of extension, exclusive of public grounds. When such a petition is filed with the Board of Works the Board is to require written notice to be given to the "Company to have its representatives before the Board not less than 5 days after the service of the notice to show cause why the petition should not be granted. If after the hearing it shall appear to the Board that the petition has been signed as provided and contains the agreement as to burners required and that such extension may reasonably be required, it shall make an order causing the extension to be made, and fix in the order the time when the work shall be completed, which period of time shall in all cases be of sufficient length that the Company, party of the second part, by the exercise of reasonable diligence, may be able to make such extension within such time." If the Company fails to make the extension within the time fixed it shall pay the city as damages for breach of contract the sum of $500 for each day the completion of such contract is delayed beyond the period so fixed. The Company, however, is not to be required to extend any of its lines between November 1st of any year and April 1st of the following year. It may use in the measuring of gas no meters that are over 2 per cent. fast or 3 per cent. slow. To determine this the Board of Works is empowered to employ experts to decide upon the accuracy of the meters, and the Company binds itself to pay the cost of such expert service; but experts may be employed only when complaint is made to the Board either as to the quality of the gas or as to the accuracy of the meter measurement, and that the Board is satisfied that the complaints are well founded. Nothing in the contract shall be construed to require the city to continue the lighting of any of the public buildings or public places, and the city reserves the right to discontinue the lighting of such places at its pleasure.

Electric Light Standards.

In a paper, by Mr. Reginald A. Fessenden, read at the Boston meeting of the American Institute of Electrical Engineers, the author remarked that in previous communications by him the following were suggested:

1. A standard of radiation.

2. A standard of light (to be used as primary standard), which need not be accurate to much within one-half per cent. in view of the great difference between the eyes of different observers in regard to visibility of light of different wave lengths.

3. A secondary standard of light, consisting of electric incandescent lamps of 16-candle power, the filaments being placed in bulbs of exceptionally good vacua and of the size used for 100 candle power.

Since the publication of the above the following points have been noted: That as the yellowish green part of the spectrum seems to be the most constant in physiological effect the standard of luminous effect should be 1 watt of light of this wave length.

That the blackened copper ball suggested by the writer as a standard of radiation does not give a perfectly uniform distribution of radiation; or rather, that the presence of convection currents in the air interferes with the uniform distribution of the radiation, as one part of the ball is thus rendered slightly hotter than another. This might be obviated by placing in vacua, but other difficulties are thus introduced. The solution finally adopted is that of having a plane surface of copper of large extent, blackened with platinum black to a fixed degree determined by the current passed.

This method of coating with platinum black was first suggested by Lummer and Kurlbaum, and with wires placed within the copper slab of such resistance and carrying such current that .01 watt is radiated per square cm. of surface of the slab; the slab to be 1 meter in diameter, of circular section, 1 cm. in thickness and its back and sides covered with a layer of 3 cms. of eider down; the slab to be supported in a horizontal plane, and face downwards, and with rim around it. Under these conditions it has been ascertained from preliminary experiments on a disk of smaller size, convection currents play a small part and the radiation to a point placed 10 cms. from the face of the plate is very closely the theoretical amount.

In use with this standard the balance thermopile described by the writer in a previous communication must have its faces at right angles, like the letter L, and be reversible, as before.

THE AMERICAN GAS LIGHT JOURNAL

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MONDAY, JULY 10, 1899.

The Approaching Famine in Iron.

Iron Age says that the predicted shortage in pig iron is beginning to be felt, particularly in foundry irons in the West. Instances are coming to light of foundries being obliged to shut down for several days awaiting receipts of needed raw material. So far it is believed that the trouble has been caused by the non-arrival of special brands desired for the usual mixture on which the foundry has been running, or to the deferring of purchases a little too long to secure shipments in time to insure steady operation. But it is nevertheless a fact to be considered that the stoppage of foundries for lack of any kind of pig iron is a new experience in the trade which points to further trouble of the same character. While many consumers of iron are forehanded and are extremely careful not to run short in any part of their supply, a considerable percentage will aways fight advancing prices and will buy from hand to mouth, expecting continually to be able to do better for themselves a little later.

These are the people who are paying premiums for immediate delivery and are thus running up prices beyond the quotations at which time contracts can be made. Enough of them are found in every iron consuming center to give increasing strength to a naturally strong market. From present appearances it will not be long until the slow buyers shall have taken all the available supply of pig iron without regard to brand and the famine will then be appreciated in earnest.

Much inconvenience is being experienced in other branches of trade by reason of the extraordinary pressure for iron and steel. Work is being delayed on bridges and buildings because essential parts are not being delivered in time. It also extends into small wares, manufacturers using malleable castings being obliged to wait unreasonably long for the delivery of pieces needed to finish work which they have in hand. Annoyances of this character are being seriously felt in the hardware trade. Those who are still skeptical about an iron famine need only to interview a few manufacturers and consumers to unearth convincing evidence.

The Market for Gas Securities.

The local gas share market was strong and dull during the week, with no particular change in values, save in the instance of New Amsterdam and Standard, the former of which sold above 36. Consolidated sold up to 190 and down to 188, with 188¾ to 189 as the opening quotation to-day, Friday. Standard common was bid 118 to 120, and the preferred is reported at 125 to 135. There is no change in respect of the rate war, but there are many meetings of the generals who are conducting it.

Brooklyn Union is 142 to 145; Peoples, of Chicago, is 120¾ to 121; and Bay State is 2⅛ to 2¼. The interest on the Boston United Gas bond issues due this July has been met. Lacledes are steady; Western, of Milwaukee, is strong; and the same may be said of Madison, Wis., which looks to us a purchase. Baltimore Consolidated is 61½ to 62. Progress towards consolidation in Jersey City is underway. As we understand it the prices offered are: Jersey City, $250 per share; Peoples, $250; Consumers, $100. The price for the first does not seem commensurate with its real value.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JULY 10.

☞ All communications will receive particular attention
☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$39,078,000	100	188¾	189
Central Union, Bonds, 5's.	3,000,000	1,000	107½	108¾
Equitable Bonds, 6's	1,000,000	1,000	108	..
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	250	..
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co.	13,000,000	100	35½	36
Preferred	10,000,000	100	60¼	61
Bonds, 5's	11,000,000	1,000	100¼	101
Northern Union, Bonds, 5's.	1,250,000	1,000	95	97
New York and East River.. Bonds 1st 5's	3,500,000	1,000	109	111
" 1st Con. 5's	1,500,000	..	112	114
Richmond Co., S. I.	348,650	50	70	..
" Bonds	100,000	1,000	..	..
Standard	5,000,000	100	118	120
Preferred	5,000,000	100	125	135
Bonds, 1st Mortgage, 5's	1,500,000	1,000	112	114
Yonkers	299,65	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	142	145
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	2⅛	2¼
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works.	450,000	100	40	..
" 1st Mtg. 5's	450,000	1,000	95	98
Boston United Gas Co.— 1s Series S. F. Trust	7,000,000	1,000	92	..
2d " " "	3,000,000	1,000	68	71
Buffalo City Gas Co.	5,500,000	100	10	11
" " Bonds, 5's	5,250,000	1,000	84	86
Central, San Francisco	2,000,000	..	105	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Columbus	1,144,700	100	70	75
1st Mortgage	1,207,000	1,000	106	108
Consumers. Jersey City	2,000,000	100	95	..
" Bonds	600,000	1,000	107½	110
Cincinnati G. & C. Co.	8,500,000	100	175	180
Consumers, Toronto	1,700,000	50	230	235
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Consolidated, Baltimore	11,000,000	100	61½	62
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	21	23
" Con. Mtg. 5's	880,000	1,000	87	90
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,560,000	50	65	65½
" Prior Lien 5's	4,546,000	1,000	94¾	94½
Detroit Gas Co., 5's	423,000	1,000	95½	96
" Inc. 5's	31,000	100	..	..
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Fort Wayne	2,000,000	..	77	83
" Bonds	2,000,000	..	80	85
Grand Rapids Gas Lt. Co.	1,000,000	50	..	..
" 1st Mtg. 5's	1,125,000	1,000	..	..
Hartford	750,000	25	..	220
Indianapolis	2,000,000	..	122	128
" Bonds, 6's	2 650,000	..	105	106
Jackson Gas Co	250,000	50	50	..
" 1st Mtg. 5's	250,000	1,000	96	100
Jersey City	750,000	20	225	275
Lafayette Gas Co., Ind.	1,000,000	100	68	70
Bonds	1,000,000	1,000	81	86
Louisville	2,570,000	50	106	108
Laclede, St. Louis	7,500,000	100	53	54
Preferred	2,500,000	100	95	100
Bonds	10,000,000	1,000	107	108
Madison Gas & Elec. Co.	400,000	100	68	70
" 1st Mtg. 6's	350,000	1,000	102	..
Montreal, Canada	2,000,000	100	200	..
Newark, N. J., Gas Co.	1,000,000	..	200	220
Bonds, 6's	4,000,000	..	128	130x
New Haven	1,000,000	25	280	300
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	53½	55
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	120¾	120⅞
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,00	1,000	111¼	112
2d "	2,500,000	1,000	104	105
Peoples, Jersey City	500,000	50	215	..
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	74	75
St. Paul Gas Light Co.	1,500,000	100	50	53
1st Mortgage 6's	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,428,000	1,000	80	82
St. Joseph Gas Co	1,000,000	100	42	44
" 1st Mtg. 5's	750,000	1,000	96	99
Syracuse, N. Y.	1,750,000	100	12	14
Bonds	1,612 000	1,000	81	84
Washington, D. C	2,000,000	20	260	265
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	100	99	100
Bonds, 5's	3,830,500	.	106	108
Wilmington, Del.	550,000		208	..

Advertisers' Index.

GAS ENGINEERS.

	Page
Wm. Henry White, New York City	75
Fred. Bredel, Milwaukee, Wis.	62
Geo. R. Rowland, New York City	50
The Western Gas Construction Co., Fort Wayne, Ind.	40
Humphreys & Glasgow, New York City	60
American Gas Co., Phila., Pa.	62
David Leavitt Hough, New York City	72
Economical Gas Apparatus Construct'n Co., Toronto, Ont.	64
Baxter & Young, Detroit, Mich.	72
United Gas Improvement Co., Phila., Pa	67
James T. Lynn, Detroit, Mich.	72
A. E. Boardman, Brevard, N. C.	72
Gilbert & Barker Mfg. Co., New York City	58

PROCESSES.

Bartlett, Hayward & Co., Baltimore, Md..... 73
United Gas Improvement Co., Phila., Pa..... 67
Burdett Loomis, Hartford, Conn..... 74
National Gas and Water Co., Chicago, Ills..... 69
Economical Gas Apparatus Construct'n Co.,Toronto, Ont. 64
The Western Gas Construction Co., Fort Wayne, Ind.... 40
Humphreys & Glasgow, New York City..... 60
Gilbert & Barker Mfg. Co., New York City..... 58
Sutherland Construction & Improvement Co., N.Y. City 59

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd's Sons, New York City..... 76
Continental Iron Works, Brooklyn, N. Y..... 74
Deily & Fowler, Phila., Pa..... 76
Kerr Murray Mfg. Co., Fort Wayne, Ind 72
Stacey Mfg. Co., Cincinnati, Ohio..... 75
Bartlett, Hayward & Co., Baltimore, Md..... 73
Davis and Farnum Mfg. Co., Waltham, Mass..... 72
R. D. Wood & Co., Phila., Pa..... 74
Isbell-Porter Company, New York City..... 74
Fred. Bredel, Milwaukee, Wis..... 62
United Gas Improvement Co., Phila., Pa..... 67
National Gas and Water Co., Chicago, Ills..... 69
Economical Gas Apparatus Construct'n Co., Toronto, Ont. 64
The Western Gas Construction Co., Fort Wayne, Ind.... 40
Humphreys & Glasgow, New York City..... 60
American Gas Co., Phila., Pa. 62
Logan Iron Works, Brooklyn, N. Y..... 76
Riter-Conley Mfg. Co., Pittsburgh, Pa..... 75
Baxter & Young, Detroit, Mich..... 72
Berlin Iron Bridge Co., East Berlin, Conn..... 61
G. Shepard Page's Sons, New York City..... 72
James T. Lynn, Detroit, Mich 72
A. E. Boardman, Brevard, N. C..... 72
Gilbert & Barker Mfg. Co., New York City..... 58
Sutherland Construction & Improvement Co., N.Y. City 59

SCRUBBERS AND CONDENSERS.

R. D. Wood & Co., Phila., Pa..... 74
James R. Floyd's Sons, New York City..... 76
Continental Iron Works, Brooklyn, N. Y..... 74
Logan Iron Works, Brooklyn, N. Y..... 76
Riter-Conley Mfg. Co., Pittsburgh, Pa..... 75

TAR AND CARBONIC ACID EXTRACTOR.

R. D. Wood & Co., Phila., Pa..... 74

AMMONIA CONCENTRATORS.

Michigan Ammonia Works, Detroit, Mich..... 58
American Gas Company, Phila., Pa..... 62

GAS METERS.

John J. Griffin & Co., Phila., Pa..... 80
American Meter Co., New York and Philadelphia..... 79
Helme & McIlhenny, Phila., Pa..... 79
D. McDonald & Co., Albany, N.Y..... 77
Nathaniel Tufts Meter Co., Boston, Mass..... 78
Maryland Meter and Mfg. Co., Baltimore, Md..... 78
Metric Metal Co., Erie, Pa 79
Keystone Meter Co., Royersford, Pa..... 78
Detroit Meter Company, Detroit, Mich..... 80

PREPAYMENT METERS.

American Meter Co., New York and Philadelphia..... 79
John J. Griffin & Co., Phila., Pa..... 80
D. McDonald & Co., Albany, N. Y..... 77
Helme & McIlhenny, Phila., Pa..... 79
Nathaniel Tufts Meter Co., Boston, Mass..... 78

GAS AND WATER PIPES.

M. J. Drummond & Co., New York City..... 77
R. D. Wood & Co., Phila., Pa..... 74
Warren Foundry and Machine Co., New York City..... 77
Donaldson Iron Co., Emaus, Pa..... 77
Utica Pipe Foundry Co., Utica, N. Y..... 77

PIPE CUTTERS.

The Anderson Pipe Cutter Co., East Boston, Mass..... 59

GAS MAIN STOPPERS.

Safety Gas Main Stopper Co., N. Y. City..... 59

STEAM BLOWER FOR BURNING BREEZE.

H. E. Parson, Brooklyn, N. Y..... 69

GAS COALS.

Penn Gas Coal Co., Phila., Pa..... 71
Perkins & Co., New York City 70
Despard Gas Coal Co., Baltimore, Md..... 71
Westmoreland Coal Co., Phila., Pa..... 71
Berwind-White Coal Mining Co., New York and Phila... 70

CANNEL COALS.

Perkins & Co., New York City 70
Greasy Creek Cannel Coal and Tramway Co., Chicago.. 58

CONVEYORS.

The Link-Belt Machinery Co., Chicago, Ills 58

GAS ENRICHERS.

Standard Oil Co., New York City 71
The Sun Oil Co., Pittsburgh, Pa..... 71

COKE CRUSHER.

C. M. Keller, Columbus, Ind..... 71

GAS GAUGES.

The Bristol Co., Waterbury, Conn..... 60

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City 60
Isbell-Porter Co., New York City..... 74
R. D. Wood & Co., Phila., Pa..... 74
Wm M. Crane Co., New York City..... 20

CEMENTS.

C. L. Gerould & Co., Mount Vernon, N.Y..... 68

RETORTS AND FIREBRICKS.

J. H. Gautier & Co., Jersey City, N. J..... 68
B. Kreischer & Sons, New York City..... 68
Adam Weber, New York City..... 68
Laclede Firebrick Mfg Co., St. Louis, Mo..... 68
Cyrus Borgner, Phila., Pa..... 68
James Gardner, Jr., Pittsburgh, Pa..... 68
Henry Maurer & Son, New York City..... 68
Baltimore Retort and Firebrick Co., Baltimore, Md..... 68
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 68
Brooklyn Firebrick Works, Brooklyn, N. Y..... 68

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md..... 73
Fred. Bredel, Milwaukee, Wis..... 62
J. H. Gautier & Co., Jersey City, N. J..... 68
Parker-Russell Mining and Mfg. Co., St. Louis, Mo..... 68
Adam Weber New York City..... 68

SELF-SEALING MOUTHPIECE DOORS.

Isbell-Porter Co., New York City..... 74
Continental Iron Works, Brooklyn, N.Y..... 74
Logan Iron Works, Brooklyn, N. Y 76
R. D. Wood & Co., Phila., Pa..... 74

INCANDESCENT GAS LAMPS.

Welsbach Commercial Co., Phila., Pa..... 66

BURNERS.

C. A. Gefrorer, Phila., Pa..... 74
Wm. M. Crane Co., New York City 18
D. M. Steward Mfg. Co., Chattanooga, Tenn..... 59

LAVA GAS TIPS.

D. M. Steward Mfg. Co., Chattanooga, Tenn..... 59

STREET LAMPS.

Welsbach Street Lighting Co., New York and Phila..... 64
Thos. T. W. Miner, New York City 59

PURIFYING MATERIALS.

Connelly Iron Sponge and Governor Co., New York City 69
Greenpoint Chemical Works, Brooklyn, N.Y..... 61
van Baarda & Co., Dusseldorf-on-the-Rhine..... 69

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y..... 60
Chapman Valve Manufacturing Co., Boston, Mass..... 60
R. D. Wood & Co., Phila., Pa..... 74
Continental Iron Works, Brooklyn, N. Y..... 74
The P. H. & F. M. Roots Co., Connersville, Ind..... 68
Isbell-Porter Co., New York City..... 74
The Western Gas Construction Co., Fort Wayne Ind.... 40

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind..... 68
Isbell-Porter Company, New York City..... 74
Connelly Iron Sponge and Governor Co New York City 69

ELECTRICAL APPARATUS.

Wm. Henry White, New York City 75

GAS ENGINES.

Backus Water Motor Co., Newark, N. J..... 58

ENGINES AND BOILERS.

The Hazelton Boiler Company, New York City..... 59

PURIFIER SCREENS.

John Cabot, New York City..... 60

GAS STOVES.

American Meter Co., New York and Philadelphia..... 65
Maryland Meter and Manufacturing Co., Baltimore, Md. 78
Keystone Meter Co., Royersford, Pa..... 78
Wm. M. Crane Co., New York City..... 20
Nathaniel Tufts Meter Co., Boston, Mass..... 78

HOT WATER HEATERS.

J. P. B. Sadtler & Co., Baltimore, Md..... 58
Wm. M. Crane Co., New York City..... 20

GASHOLDER TANKS.

J. P. Whittier, Brooklyn, N. Y..... 60

GASHOLDERS.

Bartlett, Hayward & Co., Baltimore, Md..... 73
Continental Iron Works, Brooklyn, N. Y..... 74
Deily & Fowler, Philadelphia, Pa..... 76
Davis & Farnum Mfg. Co., Waltham, Mass..... 72
Kerr Murray Mfg. Co., Fort Wayne, Ind..... 72
Stacey Mfg. Co., Cincinnati, Ohio..... 75
R. D. Wood & Co., Philadelphia, Pa..... 74
Logan Iron Works, Brooklyn, N. Y..... 76
Riter-Conley Mfg. Co., Pittsburgh, Pa..... 75

CHEMICALS.

Emken Chemical Co., New York City..... 58

GAS SECURITIES.

Henry Marquand & Co., New York City..... 58

PATENTS.

H. S. Thornberry, Washington, D. C..... 77

ADVERTISING.

J. Howland Harding, New York City..... 57

BOOKS, ETC.

Newbigging's Handbook..... 60
Scientific Books..... 70
Digest of Gas Cases..... 71
Practical Photometry..... 68
Gas Flow Computers..... 71
Hughes' "Gas Works"..... 69
Gas Engineer's Pocket-Book..... 61
Excerpts from Reports of Gas Commissioners..... 73
Poole on Fuels 79
Binders..... 77
Directory of Gas Companies..... 75
Practical Handbook on Gas Engines 60

DIVIDEND NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILA., PA., June 22, 1899.

The Directors have this day declared a quarterly dividend of 2 per cent. (one dollar per share), payable July 15, 1899, to stockholders of record at the close of business June 30. Checks will be mailed.

1256-2 EDWARD C. LEE, Treasurer.

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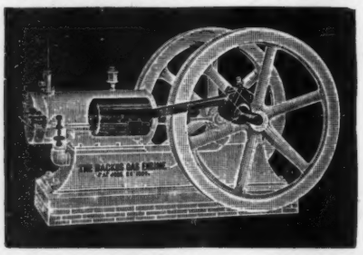

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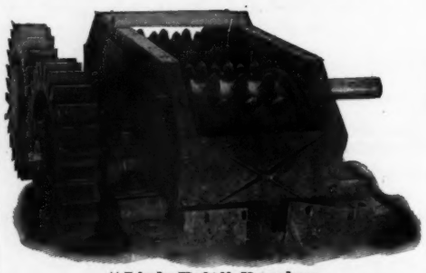

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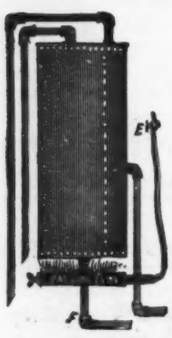

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Yours very truly, E. H. JENKINS, Engineer.

BALTIMORE, MD., March 24, 1899.
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Respecfully,
GEO. BEADENKOPP, Ass't Engineer, Con. Gas Co

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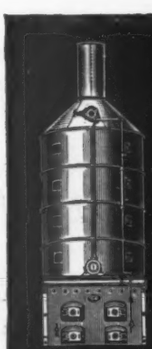

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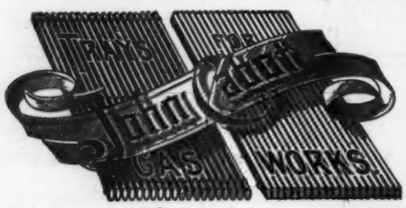

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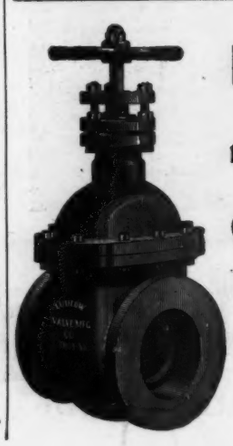

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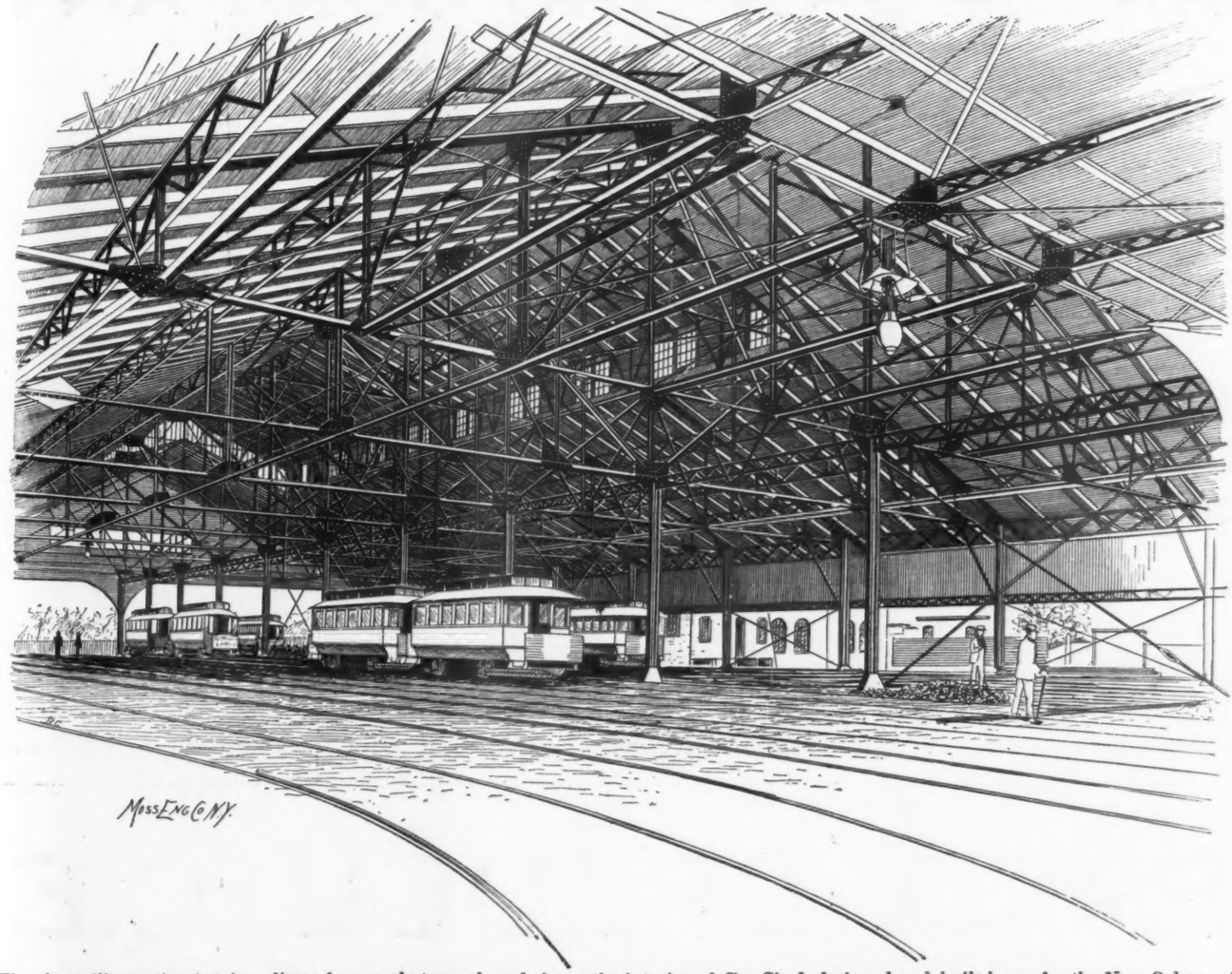

The above illustration is taken direct from a photograph and shows the interior of Car Shed, designed and built by us for the New Orleans & Carrollton R. R. Co., at New Orleans, La. The building is constructed entirely of steel and covered with corrugated steel. It is 130 feet wide and 300 feet long. The sides are left open for a distance of 10 feet from the surface of the ground, and the ends are left open entirely from the tie beam to the ground.

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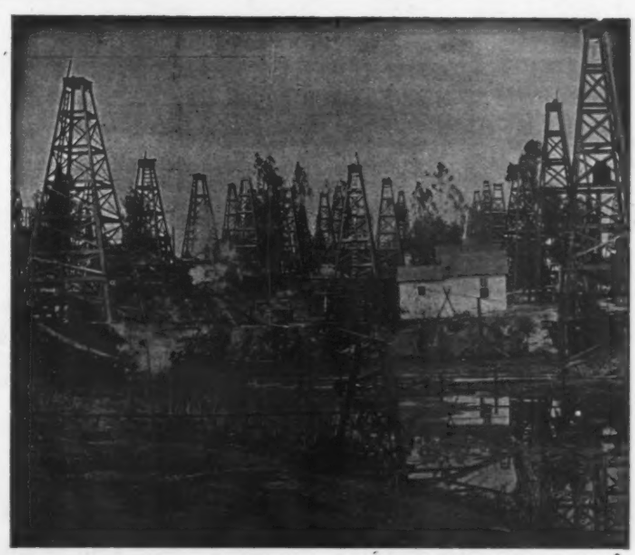

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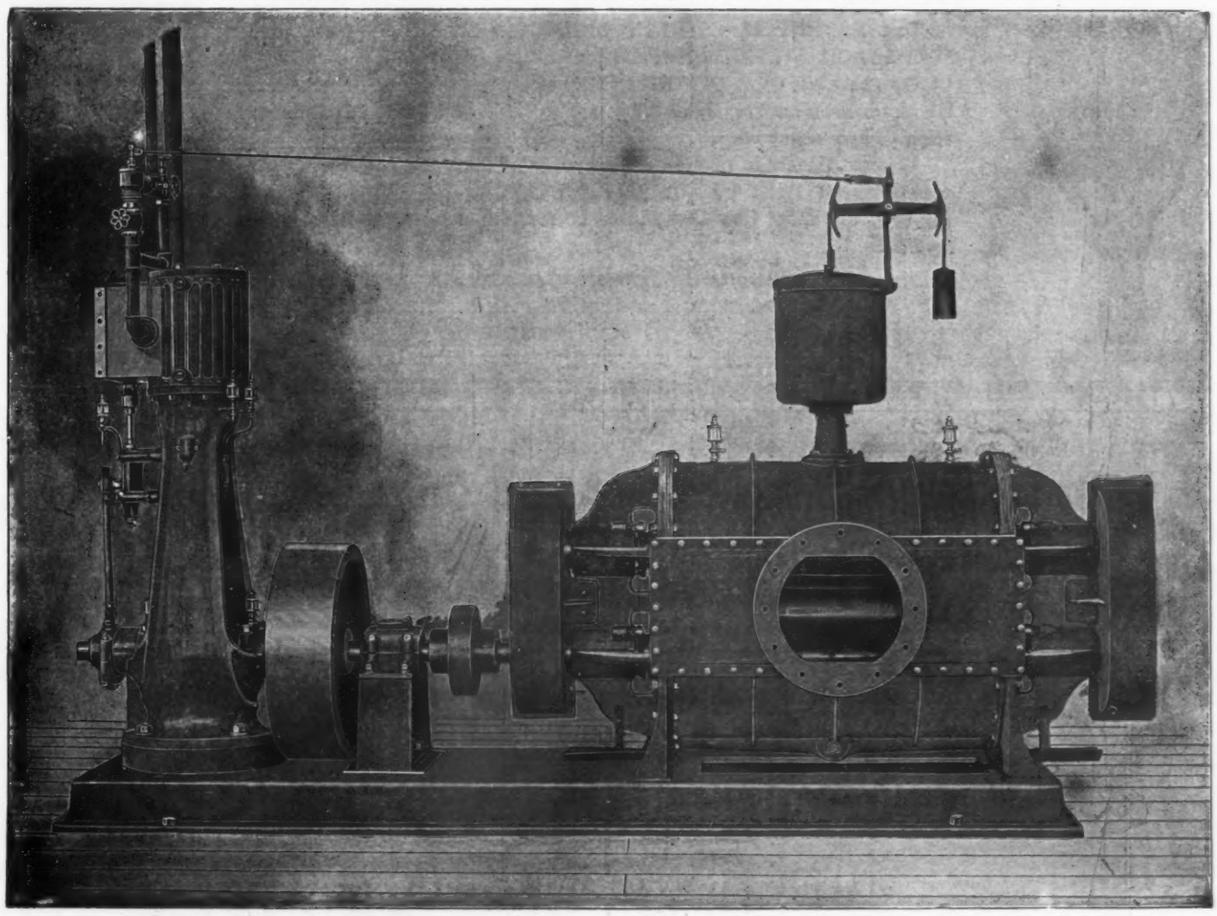

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Eastern Office:

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—OWNS, CONTROLS AND OPERATES—
EXCLUSIVELY

STYLE No. 81.

THE NEW IMPROVED AND PATENTED STREET LIGHT BURNER.

Our PATENTED "STREET LIGHT APPLIANCES" have made WELSBACH STREET LIGHTING a complete success.

By the UNIFORM DISTRIBUTION of light on scientific principles a greater area can be lighted by our system and more economically than in any other way.

Where there are no gas mains already laid, we can furnish an equally good light by our **SELF-GENERATING NAPHTHA WELSBACH BURNER,** enabling Gas Companies to furnish a uniform light in all localities.

Lists of Cities and Towns in which we are now lighting under contract will be furnished upon application.

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Windsor Street Works, Birmingham, Eng.	2,000,000
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Halifax, Eng.	1,000,000
Toronto,	250,000
Ottawa,	250,000
Toronto (Second Contract, Remodeled),	2,000,000
Lindsay (Remodeled),	125,000
Belleville,	250,000
Ottawa (Second Contract),	250,000
Brantford (Remodeled)	200,000
St. Catherine's (Remodeled),	250,000
Kingston, Pa.	125,000
Montreal,	500,000
Peterborough, Ont.	250,000
Wilkesbarre, Pa.	750,000
St. Catherine's (Second Contract),	250,000
Buffalo, N. Y.	2,000,000
Winnipeg, Man.	500,000
Colchester, Eng. (Second Contract),	300,000
York, Eng.	750,000
Rochester, Eng.	500,000
Kingston, Ont.	300,000
Crystal Palace District, Eng.	2,000,000
Duluth, Minn.	300,000
Caterham, Eng.	150,000
Enschede, Holland,	150,000
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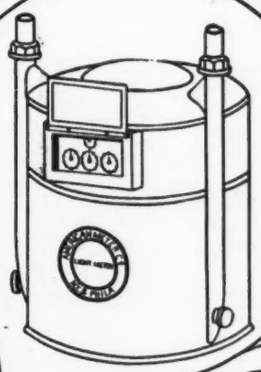

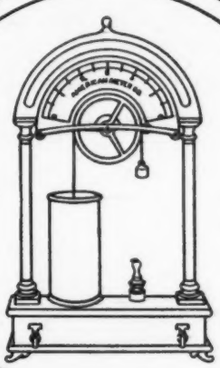

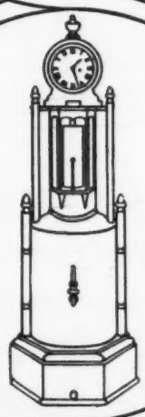

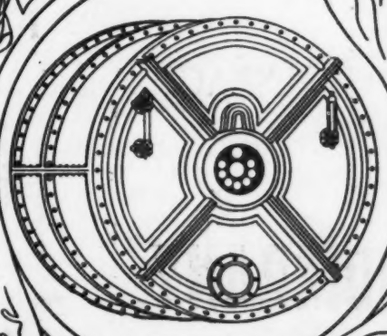

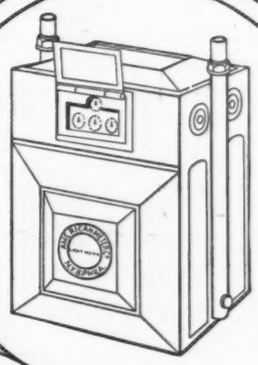

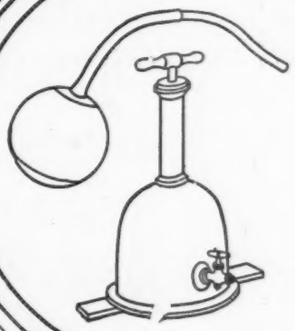

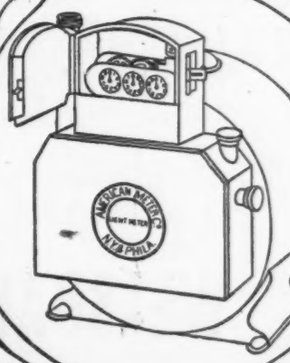

PUBLIC LIGHTING TABLE.

JULY, 1899.

Day of Week.	Table No. 1. Following the Moon.			Table No. 2. New York City. All Night Lighting.	
	Date.	Light.	Extinguish.	Light.	Extinguish.
				P.M.	A.M.
Sat.	1	8.00 PM	1.20 AM	7.30	3.15
Sun.	2	8.00	2.00	7.30	3.15
Mon.	3	8.00	2.40	7.30	3.15
Tue.	4	8.00	3.40	7.30	3.15
Wed.	5	8.00	3.40	7.30	3.15
Thu.	6	8.00	3.40	7.30	3.15
Fri.	7	8.00 NM	3.40	7.30	3.15
Sat.	8	8.00	3.40	7.30	3.15
Sun.	9	8.00	3.40	7.30	3.15
Mon.	10	8.00	3.40	7.30	3.15
Tue.	11	8.00	3.40	7.30	3.15
Wed.	12	8 40	3.40	7.30	3.15
Thu.	13	9.10	3.40	7.30	3.15
Fri.	14	9.30	3.40	7.30	3.15
Sat.	15	10.00 FQ	3.40	7.30	3.15
Sun.	16	10.40	3.50	7.20	3.15
Mon.	17	11.10	3.50	7.20	3.15
Tue.	18	12.00 AM	3.50	7.20	3.15
Wed.	19	1.00	3.50	7.20	3.15
Thu.	20	2.10	3.50	7.20	3.15
Fri.	21	No L.	No L.	7.20	3.15
Sat.	22	No L. FM	No L.	7.20	3.15
Sun.	23	No L.	No L.	7.20	3.15
Mon.	24	7.50 PM	9.20 PM	7.20	3.15
Tue.	25	7.50	9.50	7.20	3.15
Wed.	26	7.50	10.20	7.20	3.15
Thu.	27	7.50	10.50	7.20	3.15
Fri.	28	7.50 LQ	11.30	7.20	3.15
Sat.	29	7.50	12 00 AM	7.20	3.15
Sun.	30	7.40	12.40	7.10	3.30
Mon.	31	7.40	1.30	7.10	3.30

TOTAL HOURS LIGHTING DURING 1899.

By Table No. 1.	Hrs. Min.	By Table No. 2.	Hrs. Min.
January	215.40	January	423.20
February	184.40	February	355.25
March	187.40	March	355.35
April	166.50	April	298.50
May	158.00	May	264.50
June	140.50	June	234.25
July	150.30	July	243.45
August	168.30	August	280.25
September	179.50	September	321.15
October	213.20	October	374.30
November	217.00	November	401.40
December	238.10	December	433.45
Total, yr.	2221.00	Total, yr.	3987.45

Welsbach Patent Again Sustained.

Following the recent decision in the United States Circuit Court of Appeals, sustaining the Welsbach Company's Patent, Judge Lacombe, in the United States Circuit Court, has enjoined the following infringers of the Welsbach Patent:

DAYLIGHT INCANDESCENT GAS LAMP CO.
REX INCANDESCENT GAS LIGHT CO.
AMERICAN INCANDESCENT LIGHT CO.
NEW YORK CHEMICAL REFINING CO.
UNION INCANDESCENT LIGHT CO.
AMERICAN LIGHTING CO.
YOUNG & FLETCHER CO.
HECKLA MANTLE WORKS, Henry Anhalzer, Prop'r.
MERIDEN-ALBERTA MANTLE CO.

You are cautioned against infringement of the Welsbach Patent, as you will be held liable for an accounting.

All genuine Welsbach Lights bear the trademark "WELSBACH," and are for sale by all first-class dealers in Gas Appliances.

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Philadelphia.

The United Gas Improvement Company,

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THE STANDARD JUNIOR,

THE STANDARD DOUBLE SUPERHEATER,

LOWE WATER GAS APPARATUS.

Under Contract, 1899:

	SETS.	DAILY CAPACITY.
Fostoria, O.	1	250,000 Cubic Feet.
Derby, Conn.	1	750,000 "
Lowell, Mass.	1	1,000,000 "
Doylestown, Pa.	1	50,000 "
Darby, Pa.	1	400,000 "
Adrian, Mich.	1	125,000 "
Concord, N. H.	1	400,000 "
Sioux City, Iowa	1	750,000 "
Standard Gas Light Co., New York	3	5,400,000 "
Peekskill, N. Y.	1	250,000 "
Westchester, N. Y.	1	250,000 "
Jersey City, N. J.	1	1,000,000 "
Stapleton, N. Y.	1	750,000 "
London, O.	1	125,000 "
Chicago, Ills.	2	3,600,000 "
Putnam, Conn.	1	125,000 "
Mansfield, O.	1	250,000 "
Plymouth, Pa.	1	125,000 "
Athens, Pa.	1	125,000 "
Total	22	15,725,000 "
Previously built	294	187,100,000 "
Grand Total	316	202,825,000 "

Established 1858. Incorporated 1890.
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H. D. ABERNETHY, Sec.

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A PURIFYING MATERIAL FOR GAS.
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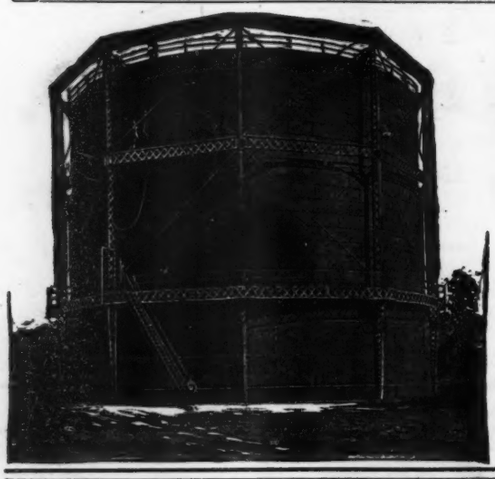

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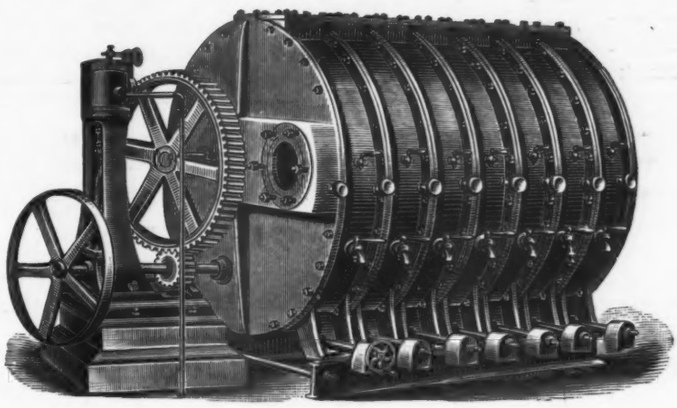

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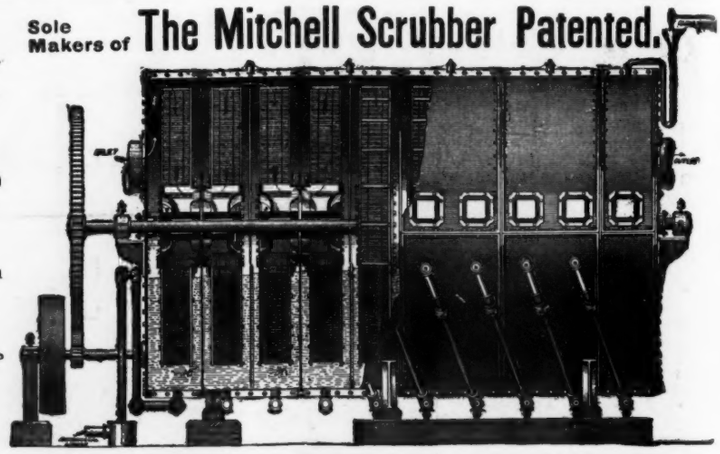

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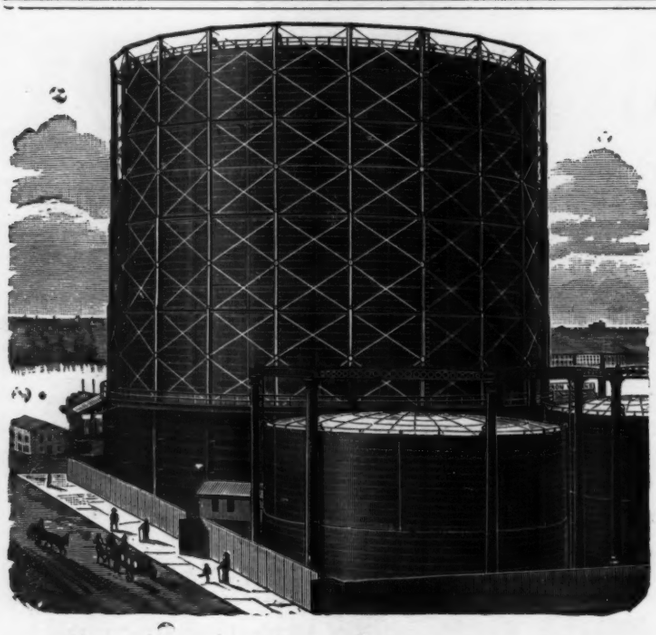

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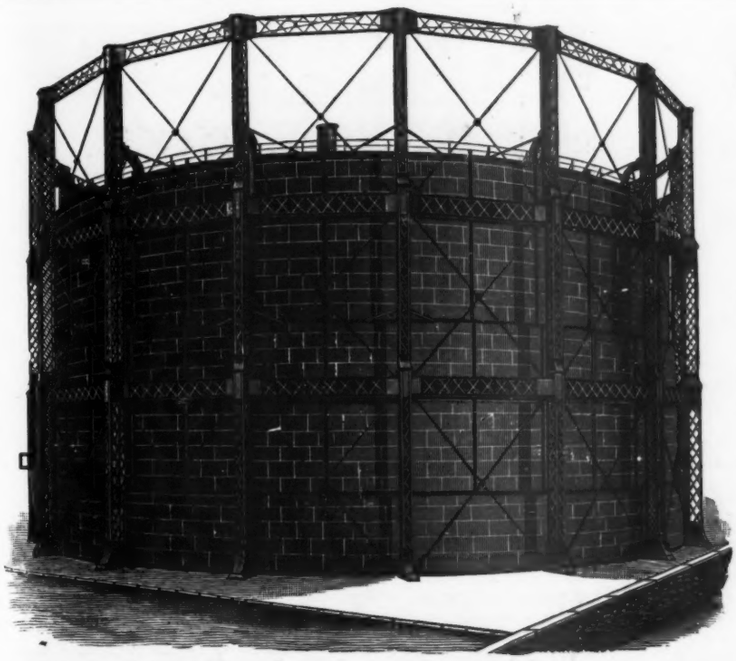

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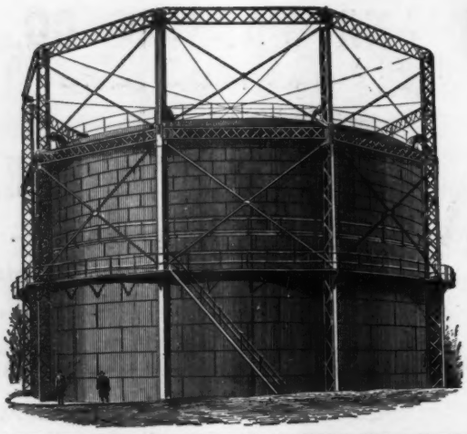

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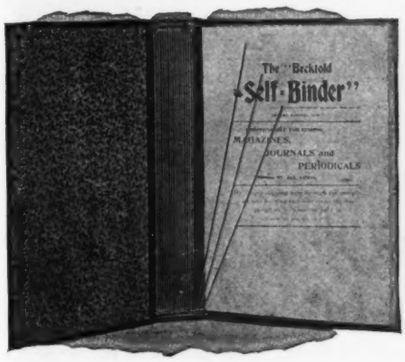

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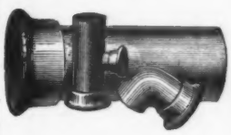

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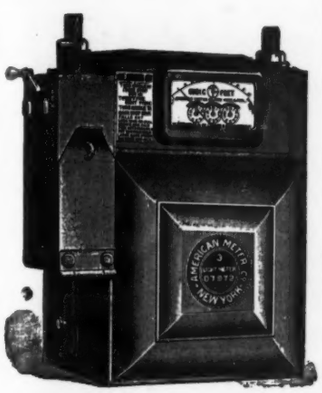

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